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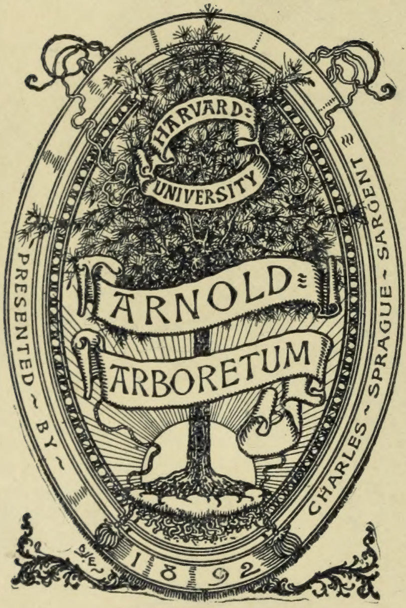
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AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M.A., F.L.S.

Director of Gardens, S. S.

Vol. IV.

NEW SERIES.

Singapore:
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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.

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No. 1.] JANUARY, 1905. [VOL. IV.

NOTES ON PLANTING PARA RUBBER IN JOHORE.

BY R. W. BURGESS.

HOLLENBURY ESTATE,
Muar, December 21st, 1904.

Having during the last seven months had an opportunity of observing various methods of planting out rubber in practice, a few notes on the same may be of interest to those who, like myself, are starting the culture of Hevea Brasiliensis. The three usual methods are, planting stumps, transplanting seedlings, and planting seed at stake. To take first the method I believe to be most commonly adopted, *viz.*, that of planting stumps. The stumps are pulled up from the nursery when from 6 to 12 months old, during wet weather, when the ground is well soaked, the leaves, small roots, the end of the tap root and top shoot, are cut off with pruning scissors, and the bare stumps are transported in bundles of about 100 to the field in which they are to be planted. Holes about one foot square, and the same depth are dug, (larger or smaller according to the nature of the soil) in the centre of which a small hole is made with a stake, deep enough to take the tap root. The stump is placed in position and the hole filled in with surface earth, and pressed well down with the feet, leaving about three feet of the stump above ground. These stumps appear to retain their vitality for many months, even under very unfavourable weather conditions. Some that were planted out in April of this year have had to contend with five months of exceedingly dry weather, which set in immediately after planting, during which time there was very little sign of new growth. In some cases, feeble, pale coloured shoots were thrown out from the top, before the root growth had started. In these cases pruning scissors were used, and the stump cut back, below the false shoot. As soon as weather conditions improved, growth was very rapid, many stumps that appeared quite dead throwing up strong, vigorous, dark coloured shoots from near the root, many of those planted in

April being now over 10 feet high. The percentage of failures varies from about 20 per cent. in the dryest places, to 10 per cent. in places where more moisture was retained in the soil.

As regards planting seed at stake, this method was tried on a 10 acre field, 1,936 seeds being planted singly, 15 feet apart. This was not by any means a success, as the seeds suffered heavily from the depredations of rats, ants, etc., as soon as germination had begun. I found in many cases that the young shoot had been bitten off, and carried some distance from the seed, the inside of the seed shell being in every case full of small red ants. In some cases, where the young shoot had begun to root itself, the shoot was left in position, and the seed itself carried away. In these cases the plants survived for several days, sometimes developing a few very small and sickly looking leaves, but eventually died. In other cases the tops of the plants were eaten away as soon as they appeared above ground. I noticed that when this occurred, the plant usually sent up two shoots in place of the one destroyed, neither of which would show good growth. In some parts, I believe, it is usual to plant the seeds in bamboo pots filled with earth, the pots consisting of a section of bamboo, a few inches in length, open at each end, the pot containing one or more seeds, to be planted at stake, but of this method I have had no experience. Out of the 1,936 seeds planted at stake, 1,489 had to be replaced the following month. This was done with seedlings, from a month to six weeks old, transplanted from the nursery. This, so far as I have seen, appears to be the most satisfactory method, when possible. The plants are taken out when about 9″ to 12″ high, and when the first leaves are fully developed, but before new leaves have started. The tool in use here is a cylinder of brass, 5″ high and 4″ diameter sharpened at the bottom edge, with two side supports about 2′ 6″ high, to which is fixed a cross handle at the top. This is placed over the plant and pressed into the soil and twisted, and the plant lifted out, with a circular block of earth attached. This is disengaged from the transplanter by means of a small slab of wood, to which a circular wooden block is attached, corresponding with the inner diameter of the transplanter. The transplanter, containing the soil and plant is placed over this block and pressed down. By this method a coolie can easily take out 400 to 500 plants a day. This appears to me to be the ideal method of planting out, for many reasons. First, any failures in germination of seeds will occur in the nursery. Second, failures after planting out are reduced to a minimum (in the present instance being only about one per cent). Third, no large holes need be dug to receive the plant. Fourth, there is absolutely no check to the growth of the plant, as is bound to be the case when planting stumps even under the most favourable conditions. Many plants that were taken out in October when less than one foot high are now over three feet. It may of course be argued that the stumps, when they start, make a stronger and stouter plant, but it appears to me that the growth of the young plant could, if necessary, be checked quite as easily by pruning, without disturbing the root. Of course, transplanting is not always possible, as it depends on several conditions. The soil in the nursery must be soft enough to allow the transplanter to be pressed in easily, and, on the other hand, must be firm enough to retain its shape when removed from the transplanter. Again, it is obviously not always possible to have plants of the right age in the nursery, and the nurseries must not be too far away from the field to be planted. Doubtless, in planting up on a large scale, stumping is the most practicable method. With the exception of white ant, and a certain green beetle, found by Mr. ROGER PEARS, and already described in the Bulletin, no serious pests have yet made their appearance in this district. Some weeks since, I found a small dark brown beetle feeding on the leaves, and sent a specimen down to the Editor of the Bulletin. Since then I have found many more of them, but in nearly all instances, it has been a case of "the biter bit." The insect, in biting into the leaf or stem, has caused a drop of latex to exude, which has coagulated, and held it fast by the nippers. I have found as many as six of these insects on a small shoot about three inches long, some alive and some dead, but all stuck fast and quite unable to escape, thus clearly showing one of the natural functions of the latex.

R. W. BURGESS.

MANGROVE SWAMPS IN THE FEDERATED MALAY STATES.

By H. FURNIVALL.

Many trees in the mangrove swamps are used for firewood, fishing stakes and for building houses. The wood of the Tumu tree (*Bruguiera Gymnorhiza*) and Tengah tree (*Ceriops candolleana*) make the best firewood. The bark of the Tengah is used for tanning, it is greatly to be regretted that so far the manufacture of tannin extract from the bark had never been taken up by any large firm, the only work done on these lines, is done by Chinamen in a very small way. Thousands of pikuls are thrown away every year. The following specimens grow in salt swamps :—

Bakau Akik, *Rhizophora conjugata*;
Bakau Minyak, a variety of *conjugata*, not named ;
Bakau Korap, *Rhizophora mucronata* ;
Bakau Buros, *Bruguiera caryophylloides* ;
Tumu, *Bruguiera gymnorhiza* ;
Langgadei, *Bruguiera parviflora* ;
Tengah, *Ceriops candolleana* ;
Nerei, *Carapa moluccensis* ;
Api Api, *Avicennia officinalis* ;

Berembong (*Sonneratia apetala*) Perapat, Bakuta (*Cerbera Odollam*) and Kadaku, the last two named grow to a height of twelve feet, the leaves are similar to the Berembong leaf, only a little larger. Nibong *Oncosperma tigillaria*, and Nipah, *Nipa fruticans*, are also to be seen in the swamps. The names of some of the mangrove trees in Selangor differ to the Perak names, *viz.* :—

Perak, Bakau Korap,	Selangor, Bakau Itam.
Do. do. Minyak	do. do. Puteh.
Do. do. Buros	do. do. Belukap.

The commonest tree is Bakau Korap (*R. mucronata*) which is easily recognised by its stiff leaves, which are broader, and shorter than those of the others, Bakau Akit appears to grow straighter and quicker, Berembong, Bakuta and Kadaku seeds are eaten by Malays. They also make a vegetable out of langgadei and buros seeds. An interesting experiment is being made at Port Weld, Perak, an experimental plantation on a very small scale has been made with the object of determining the rate of growth of the different kinds of mangrove, measurements of seedlings will be taken every six months. The following specimens have been planted, Bakau Korap, Bakau Minyak, Bakau Akik, Langgadei, Tengah, Buros and Tumu. Measurements of some of the seedlings, which have been planted four months, have been taken, the average growth of Bakau Akik seedlings, are one inch and Tumu one and a-half inch per mensem. The seeds when planted were measured, height, girth and age being taken. No disease has been seen in the mangrove forests, but dead trees are common which presumably have been struck by lightning or died by old age. There are thousands of mosquitoes, even in the day time, in the swamps. Chinese do not appear to mind them. The most effective way of keeping them off one is to have an old kerosine oil tin filled with bark and "make smoke." The mangrove tree is slow growing as far as known; it takes a tree about 20 years to attain a 9″ diameter.

Method and cost of Extraction.—The trees are felled and cut up into billets or short lengths *in situ* and then taken out to the main streams by means of small canals or ditches which are dug in the mangrove swamps. Small boats are used for this purpose. In the remote portions the work of removal only goes on at high tide, in places to which no creeks penetrate, on some of the mangrove islands, it will be necessary to construct small tramways. The work is chiefly carried on by Chinese coolies and a few Malays, the former live in large "Kongsis" to which all provisions and water for drinking and cooking has to be brought by boat for long distances. A Chinese cooly will cut about 4,000, ten kati billets per mensem, for which his Towkay pays him $11 per thousand billets. A large Chinese sampan will hold about 1,000, ten kati billets and a small sampan 600 billets of the same size. For transporting firewood from Trong Island to Port Weld, about 13 miles, sampan men are paid at the rate of $3.80 cents per 1000, ten kati billets. As many as eight or twelve trips can be made per mensem.

Animal life in the Mangrove Swamps.—Shellfish abound, birds, king-fishers, pigeon, plover, and storks are plentiful, there is also a small harmless green snake to be met with. Monkeys, wild pig also tigers have been seen on the islands and mainland. Upon Klang Island, in Selangor, there is a large herd of elephants which has been there for many years.

H. FURNIVALL,
Assistant Conservator,
Federal Bakau Forests.

ON A SAMPLE OF COTTON GROWN IN SINGAPORE.

The following letter received by Mr. VADE possesses some interest and is thus published:

The cotton plants in question were grown by Mr. VADE in his garden in Tanglin. There were about a dozen of them cultivated in beds as ornamental plants. The variety appears to be one of the American cottons and resembles a strain cultivated in the Botanic Gardens, Singapore, which was received from India. It is very different from Sea Island cotton and also from Egyptian. The flowers are pale yellow with a distinct purple spot at the base of each petal. The continuous flowering referred to as an abnormality in the letter is not unusual in this country. It is due to the continuous rainy seasons here and the absence of a dry period. It is one of the objections to cotton-growing so near the equator, for the crop being dispersed over the year instead of ripening all at once adds considerably to the expense of collecting it.

I observed on Mr. VADE'S plants that the cotton bug (*Dysdercus*) had as usual destroyed some pods. I have seldom seen one plant of any variety of cotton that is not sooner or later attacked by this pest.

I was not able to see any samples of the cotton itself as all had been sent to Messrs. FORBES and CAMPBELL. It is not the first time that samples of cotton of very superior quality have been sent home from the Straits Settlements (*see* Bulletin III, p. 14) but unfortunately up to the present time samples only have been procurable. It is one thing to grow a sample and another thing to grow several tons. However, Mr. VADE'S strain seems to be a very good kind and it is hoped to continue experimenting with it.

70, THE ALBANY, OLDHALL STREET,
Liverpool, 17th November, 1904.
Answd: 14th December, 1904.

MESSRS. VADE & CO.,
Singapore.

Dear Sirs,—Our Manchester friends, Messrs. FINLAY CAMPBELL & Co, Ltd., have sent us a single boll of cotton and have asked us to send you a report thereon.

This boll is well grown and matured and evidently picked just at the ripe stage, the lint is excellent both as to colour and staple, the latter being of good length and strength. But unginned cotton is very deceptive, some growths suffer considerably by ginning, the staple being often cut and or weakened thereby.

We dare not put a value upon lint on a single boll, but we may say that given the same colour, length and strength of staple such cotton would rank among the best growths and would bring a very high price say about 11*d.* per lb. to-day.

You say it is from American seed, but the friend from whom the seed was obtained does not know what sort it was. From the seed in the boll we should say that it must be from either American, Sea Island or Egyptian Seed.

The plant you describe is somewhat abnormal "Eleven months old and full of bloom." In America seed time and harvest is covered by six months, and in India and Egypt, it is much about the same, 4 to 5 feet high is a good growth. In the new States of America there is little or no fertilising, in the old States, Phosphates are largely used. In the Sea Islands recuperation is brought about by allowing the land to lie fallow for a season.

We send you by this post the "West Indian Bulletin" from which you will gather much that is interesting and instructive regarding the planting and cultivation of cotton, experimental planting will teach you more; the rigid adherence to American practices has not proved successful in Africa, and your district will doubtless produce a quality of cotton peculiar to itself and by methods specifically called for by soil and climate. We would suggest that we send you small quantities of Sea Island Seed, Egyptian Seed and American ordinary seed.

And if in any way we can assist you we shall be glad to do so. We may add that we have never seen anything that could approach in quality your sample boll, grown East of Suez.

I have, etc.,

Forbes, Forbes, Campbell & Co, Ltd.

M. L. HALL,

Manager.

FIBRES.

(*Continued.*)

The Pineapple (*Ananassa sativa*) produces a very high class fibre but is very difficult to extract cheaply because of the hardness of the epidermis of the leaf. No machine seems to work it really well and economically and all the best samples have been made by hand. The largest quantity is made in the Philippines. Hand-made fibres can only be satisfactorily prepared where labour is cheap and plentiful, and this is not the case in the Malay Peninsula.

In the early days of Singapore it was manufactured by a number of Bugis men for some years, but the industry died out.

Messrs. HOGAN'S machine has turned out some good samples and it is very probable that this fibre may come again into the market in plenty from the Peninsula.

The fibre being required of as great length as possible, the short leaves of the field pines cultivated for fruit are not of any use, where however, fields have been abandoned and grown up into grass and scrub, the pines cease to give good fruit but produce leaves from six to eight feet long or even more which are suitable for fibre extraction. Such long leaved pines are to be found all over the Peninsula wherever pines have been cultivated and could be got in large quantities in some districts.

A fuller account of it will be found in Bulletin, 1st Series, p. 56, to which the reader is referred. The present value of good pineapple fibre is about £34 a ton.

Karatas plumieri, the Mexican fibre, or silk grass. This plant is a kind of wild pineapple occurring all through tropical America. It possesses a large crown of some fifty or more dark green leaves. 8 to 10 feet long and 1 to 2 inches wide narrowed upwards and armed with strong recurved thorns at the edges. The flowers are produced in a flat cake like mass in the centre and the head of fruit forms a compact mass of fusiform pulpy fruits each about 4 inches long and 1 inch through. They are eatable with a flavour of pineapple but owing to the presence apparently of siliceous spicules, are apt to cut the tongue. The plant sends up suckers and being of rapid growth soon forms a dense impenetrable thicket. *Karatas plumieri* has long been cultivated in the Botanic Gardens, Singapore, but as it is hardly ornamental and takes up a great deal of room, it has not found its way into other gardens or plantations. It might, however, be very well used for fencing purposes to keep out cattle and wild pigs, as its dense mass of thorny leaves would stop most animals. It grows rather irregularly however, and is inclined to push out in all directions. It is readily propagated from its side shoots and seems rather to prefer dry open soil. DODGE, "Useful Fibre Plants of the World," says:—"The plants are of the most prolific nature growing spontaneously in almost all soils and climate. Cultivation in its native land is therefore extremely simple and it is surprising that the plant has not received more attention from planters. The Indians cultivate the plant to some extent in Mexico, 1,222 gardens being recorded in 1830. They generally select forest for this purpose removing the undergrowth by cutting or burning. The roots of old plants are then set out 5 or 6 feet apart and at the end of a year yield leaves fit for cutting." He states further that the thorns on the leaves (which give some trouble in working the fibre) are diminished in size and number by cultivation. "The fibre varies in quality according to age, in young leaves the fibre is fine and white, with increasing age it becomes longer and coarser."

Excellent samples of this fibre were shown at the recent Agricultural Show, by Mr. SCHIRMER. They were obtained from plants grown in the Botanic Gardens in Singapore and extracted by the Hogan machine. It was shown under the name of *Bromelia pinguin*, but I find the correct name of the plant is *Karatas plumieri*. The fibre is rather thinner than that of *Fourcroya* but stronger and of a very pure silky white colour with a fine gloss. It is thicker than *Murva* fibre.

In South America where it is cleaned by hand much in the same way as pineapple fibre is prepared by scraping the leaves on a board with a heavy iron knife, it is used for the finest hammocks, nets, fishing lines, ropes, mats, sacking and clothing. "After being combed it has been pronounced to be greatly superior to Russian flax and equal to the best Belgian for application to the finest textile fabrics." (DODGE).

The chief trouble in working the plant seems to be due to its powerful thorns, which make it troublesome to cut, and which have to be cut off the edges of the leaves before passing into the machine. However, considering the ease with which the plant grows and the excellence of its fibre, it would be well worth more attention than it ever appears to have received.

Yuccas.—There are a number of species of *Yucca*, in Mexico, nearly all of which produce a good fibre, and one or two kinds are cultivated here from time to time in gardens as ornamental plants. One of these *Y. filamentosa* cultivated in the Botanic Gardens in Singapore was experimented with in Messrs. HOGAN'S machine and a good fibre extracted, the leaves seem to contain a larger proportion of fibre than almost any other tried. The fibre is rather thinner than that of *Fourcroya* and of much the same colour and strength.

Attempts have been made to utilise these fibres in America where the plants grow in great quantities, but apparently the business was given up. *Yuccas* in the Straits grow slowly and the leaves are short, it is indeed more suited for sand-hills and dry open places, and would not be suitable for a wet region like this. It might do better on the few sandy seashores we have, but it is hardly a plant to be recommended. In some places the fibre is successfully extracted by steeping the leaves in tubs of boiling water after which they are crushed between cylinders and plunged on hurdles into a boiling alkaline bath of 45 pounds of ashes to 121 gallons of water, where they are left for four hours, then taken out and washed. This simple method of working it is something in its favour, but unless localities in the Peninsula are found more suited for its growth, it can never become an important source of fibre.

Editor.

PRESENT PRICES OF FIBRES.

We have received further notes from the big European Fibre firms as to demand and prices ruling from Mr. SCHIRMER from which I make the following extracts as of interest:—

VEUVE E. BAETENS & CO., LEZ ANVERS, writes:—We give you below as requested a few explanations regarding the wants and quotations for the European market.

Green Aloe (Mauritius Hemp).—As it must be known to you this fibre has a large consumption and the value subject to the quotations of a very uncertain market, as we have seen the prices during the last ten years fluctuate between 19 and 37 shillings per cwt. for prime quality, C. F. Antwerp.

Murva (Konji Hemp) and Pineapple.—These products are shipped not in large quantities however from the Dutch possessions, Java, etc., to Rotterdam, and as you say under the name of Ananas-fibre. Their price at present is from 24 to 30 shillings a cwt. according to the length of fibre.

Aloe fibre.—(This appears to be Mauritius hemp, *Fourcroya*, roughly beaten out by natives.—Ed.) is shipped to Antwerp in thousands of bales from Bombay. Their present prices are:—No. 1, 11 to 12 shillings; No. 2, 10 shillings; No. 3, 9½ shillings per cwt.

Ramie.—We have personally the conviction that this fibre will eventually occupy the position in the textile world as cotton and flax. The quantities offered are insignificant and cannot be supplied regularly. According to the method of decortication the price fluctuates from 8 to 150 shillings per cwt., but we think that *Ramie* will get the easiest, largest and most suitable opening in the flax spinning works, when prepared in such a way as to replace in quality and price the Russian flax, this latter being about 28 shillings a cwt. (medium value market).

C. J. SCHIRMER ESQ,
Singapore.

DEAR SIR,—I duly received your letters of 8th and 10th October and in answer I beg to inform you that in the meantime I have given on your samples several reports and informations to Mr. ARNHOLD OTTO MEYER which I hope his Singapore firm, BEHN MEYER & CO., has transmitted you, but as you wish to have my reports and informations also directly I hereby enclose copy of them.

Sanseveria Fibre.—If this fibre is strong, white in colour and well cleaned, prices of £28/32 as offered by Messrs. L. ANKERSMITH & Co. for account of their San Francisco constituents are not at all out of question more .if this fibre is 80 Ctm. (31″) and above in length and in every respect without faults you can make easy £35 and more. It is as you will understand quite impossible to give a valuation from here on completely unknown qualities, colours and lengths of *Sanseveria* grown and made in the Straits. Nobody will make contract "tel quel" even if you give the guarantee to deliver not under 25 Ctm. (10″) as it may be that everything is of twenty-five Ctm. and perhaps only a little over 25 Ctm. in length.

Pineapple.—A price of £60 as mentioned by you is a fancy price and is in my opinion impossible to realize in the open market for regularly shipments, the price for this fibre will always be about the same as for *Sanseveria* which according to quality, colour and length will fetch between £27/37 per ton as a normal average price, except if of very short length, *i. e.*, under 25 Ctm.

Ramie.—(China Grass) I sent you by to-day's Mail a sample taken out of lots sold without difficulty in big qualities at £28/30 per ton

The general Hamburg market is as follows:—

Sisal.	*October.*	*November 1904.*
Mexico	£35	£35
E. G. Africa	36	36.10*s.*
Aloes.—Mauritius	28/33	29/34
D. O. Africa	28/31	30/32
Manila fair current	38.10*s.*	40.
New Zealand good fair	32.	32.10*s.*

A fair business has been done here and in the neighbour markets with an always strong upwards tendency for all fibre and hemp sorts, especially for Manila. The arrivals are not in proportion with the consumption especially not in the better qualities which are always in strong demand at daily higher prices asked and paid for, however in Sisal the market at actual high prices is dull and no contracts for shipments to arrive and term are reported.

L. RIEBOW,

Hamburg, 10th November, 1904.

RUBBER VINES IN SOUTH ANNAM.

The Bulletin Economique de Hanoi contains in No. 35, November, 1904, an important article on the Rubber vines of Southern Annam by M. VERNET. There are several species of climbing *Apocynaceæ* in this country which produce a fairly good rubber, and the French Direction de l' Agriculture has for some time been employed in studying these plants and experimenting in processes for the extraction of the latex. Of these plants the two most suitable for cultivation are *Parameria glandulifera* and *Xylinbaria Raynaudi.* The former occurs to a small extent in the Malay Peninsula. Besides these however, there are species of *Chonemorpha*, *Ecdysanthera* and *Pezizicarpus* in the forests, which also supply rubber. The rubber from these wild plants is collected by natives but as they grow only here and there in the jungle they bring in a mixture of gums and rubbers from all kinds of plants wherever they can find them and the result is consequently a very poor and valueless product. For this reason the Annam rubbers have obtained a bad reputation. It is also difficult owing to the wild way in which the lianes climb in the forests to satisfactorily tap them. After cutting into them also the latex coagulates soon in the cut mouths of the laticiferous vessels and it ceases to flow, although there may be much more in the liane, and if a cut liane is left the latex in the bark disappears little by little and when it is dead and dry the bark contains but a little rubber. The author's theory to account for this is that the caoutchouc is not a secretion but the sap of the plant, and that it being employed by the cells as nutriment is used up and so disappears. This may well be doubted. However, the action of rapidly killing the cells, by simple heat or plunging the sections of the liane into boiling water has been found to kill the cells and coagulate the latex in the bark. The pieces of the climber after being put into the boiling water, are then beaten with a club while still hot to detach the bark which when dried by fire heat or exposure to a current of air, (never by sunheat) are broken up by beating and the rubber extracted by mechanical means or solvents, sulphuric acid or potass. Only certain laticiferous barks yield to this process. It is a failure in the case of Para Rubber, Ceara Rubber and *Chonemorpha Yersini.* This latter climber appears to be very troublesome to work with.

Tables of percentages of rubber obtained from three species of vines are given:

From *Ecdysanthera Langbiani*, ·373 kilos of bark from the roots gave 7·45 per cent of Caoutchouc, ·027 kilos in all, 4·466 kilos of bark from the vine 6 cm. and more through gave 7·64 per cent ·341 kilos of rubber.

E. Annamensis gives a smaller proportion, 5·23 to 6·63 per cent. The highest percentage from the roots.

Pezizicarpus montana gave a higher percentage, *viz.*, 7·84 to 8·30, but it appears to have a thinner bark, as a stem 13·50 metres long and 5 cm. through only gave 2,000 kilos of bark as against *Ecdysanthera annamensis* which gave 6·400 kilos of bark from a liane 13 metres long and 6 cm. through.

The figures show a smaller result than those obtained from quite freshly collected barks, and it is clear that all treatment of bark should be carried out as soon as possible after collecting.

Editor.

A MEMORANDUM OF CASUARINA EQUISETIFOLIA, ITS CULTIVATION AND TREATMENT,

WITH SPECIAL REFERENCE TO THE PLANTING OF ABANDONED MINING LAND IN THE FEDERATED MALAY STATES.

Casuarina equisetifolia, Forst., Syn: *C. muricata*, Roxb. Fl. Ind· III, p. 519—Order *Casuarineæ.*

References.—Brand. Fl. N. W. & C. I, 435, Dict. Ec. Prod. of India. Gamb: Man. of Timb. 665. Cameron's For. Trees of Mysore and Coorg. 300. Agr. Bull. S. S. & F. M. S. (H. N. Ridley) Vol. I, Nos. 7 & 8. Roy. As. Soc. Journ. St. Br. No. 30 of 1897 (H. N. Ridley). Agr. Ledg. (India) 1901 VIII & 1902 II.

Popular Names:—The "Swamp Oak" of Queensland, the "Tinian-Pine," "Beefwood-Tree," Vern. "Aru" "Ru" and "Ru-Laut."

It is a tall evergreen tree, maximum height 80 feet and girth 6 feet and over. Conical in habit of growth.

Bark.—Brown, rough, fibrous peeling off in vertical strips. The bark is astringent and contains 11·1 to 18·3 per cent of tannin, giving a blue black precipitate with feric salts. It is used by fishermen in Madras for dyeing their nets. It contains also a red colouring matter attracted by mordants. The burnt ashes of the bark afford material for making soap. The decoction being of a deep red colour.

Leaves.—According to BRANDIS, branches leafless. CAMERON says the "leaves proper" reduced to mere scales at the tips of the branchlets. Disarticulate a branchlet and its upper end will be seen to be toothed usually 79 teeth referred to by CAMERON as "scaly leaves." The former description is preferred.

Branchlets.—Approximate, slender, articulate, fluted, deciduous and fulfil the function of leaves (BRANDIS). The general appearance of the branchlets feathery.

Flowers.—Monœcions, *i.e.*, with staminate and pistillate flowers, and quite inconspicuous, slightly reddish in colour. The staminate flowers monandrons in terminal, cylindrical spikes; the pistillate flowers in small pedicellate, globose heads.

Fruit.—A sub-globose cone, formed of the enlarged and thickened woody bracts, rough, varying from ½ to ¾ of an inch in length, grows in clusters at ends of branches. It turns orange yellow when ripe; seeds with a membranous wing. Fruit to be seen pretty nearly throughout the year at various stages of maturity.

Thus from its conical habit of growth, feathery branchlets, cone-like fruit and winged seed the resin it yields, it suggests the pine family, hence the popular name "Tinian Pine," on the other hand the Malay more familiar with the Casuarina curiously enough calls *Dacrydium elatum*, Wall. (*Coniferæ*) a cypress like plant which attains a similar maximum height, "Ru Bukit."

Distribution.—Indigenous to Queensland, N. Australia, the Malay Archipelago, Fiji, the Islands of the Indian Archipelago, the littoral of Chittagong, Burma and Siam. Mr. L. RICKETTS, Inspector-General of Forests, Mysore, thinks it truly indigenous to the Islands of the Malay and Fijian Archipelago and says in India "the species has not been observed to be self produced, *i. e.*, in the matter of throwing up seedlings, nor does it coppice well." Extensively planted along the sand dunes of the Madras and N. Kanara Coasts. It might be compared to *Pinus sylvestris*, L.

(Scotch Pine) or the cluster or Maritime Pine (*P. Pinaster*, vel *maritima*) in its use for the fixation of the sand dunes in Germany and the French coast of the Bay of Biscay. It is very tolerant of soils. In suitable localities, *e.g.*, in sandy or porous soils, where the subsoil is always moist and the water level within 8 to 10 feet of the surface, it is a fast growing tree. In abandoned mining lands these conditions of porosity and depth of water level more or less exist. Further Ru has the reputation of drying land exhaustively, a hopeful outlook in certain abandoned areas where the greater portion of the land is under water in heavy rains, mainly from the overflow of old mining holes.

Wood and its Uses.—Timber heavy, hard, reddish brown (beef-wood) coarse grained. Pores moderate sized to small, scattered, much sub-divided, with white walls and partitions; medullary rays very fine and very numerous and evenly distributed; concentric rings wavy, fine and close, broken up, darker nearer the centre. Seasons somewhat badly, cracks and splits under weight or exposure to the weather. Weight 50 lbs. may be taken for young unseasoned wood to 60 lbs. for old seasoned wood.

RIDLEY says it is suitable for posts being durable and resistant to termites. Mr. L. RICKETTS of Mysore holds a diametrically opposite view and condemns it for posts, *re* the termites; probably the species of termites is different in the two countries.

Its chief value is as a fuel. The reader is referred to the "Factory Engineer's, Selangor, Report", as contained in the Agricultural Bulletin, S. S. & F. M. S., Vol. I, part 8, with regard to its superior "steaming qualities over, even Bakau and ordinary firewood." According to Mr. RICKETTS, "it was reckoned that Casuarina "logs ran a train over a distance 13 per cent in excess of that "attained by the next best kind of fuel available in the Mysore "forests," this was demonstrated by experiments carried out on the Mysore State Railway. The fuel where available in India according to the same authority is preferred for domestic consumption and remarks "the people endeavour to subdue its intense heat "by adding fuel of inferior heating power," in order to save their cooking utensils from being worn out. He further adds "the same "result has happened where Casuarina is exclusively used in loco-"motives, and it is a question how far its calorific properties should "be moderated by the intermixture of other fuel substances." The ashes retain their heat for a long time.

With these introductory remarks we shall proceed to the raising and treatment of Casuarina under the following various heads:—

(*a*). *Formation and Manuring of the Nursery.*—Nursery beds of not more than 4 feet in width are now got ready, *i.e.*, cleared of all roots, stumps, stones, etc., with good drains on either side to drain off excessive moisture and are necessary owing to the heavy rains in this country. The nursery site would be selected near a permanent supply of water, *e.g.*, if selected on the area to be planted, near one of the large mining holes not liable to overflow and holding water throughout the year. Very little manure is required and it would never be fresh or raw. Burnt earth or ashes will be found useful. The burning of all roots, stumps and weeds directly over the beds serves to kill the seeds of weeds and insect life, in whatever stage of metamorphosis, and further renders the inert plant-food soluble and assimilable. Ashes afford material for the early formation of woody fibre and are therefore ef exceptional value in giving stability to the young plants.

(*b*). *Collection of Seed.*—As remarked before the fruit is ripe when it changes to an orange yellow and is noticed to drop from the base of the cluster. If whole clusters are plucked the unripe fruits near the apex should be discarded. After the collection of a sufficient number of ripe fruit, say each week's gathering, the whole should be exposed to the sun on mats. This may be done for 3 or 4 days, when all the seed will have been shed. If not required for immediate use sifting the seed and putting away in glass stoppered bottles is recommended. The fruit receptacles or empty cones may be burnt over the beds as they contain potash amongst other constituents. Care should be taken that the mats are carried in during showers; kerosine oil sprinkled in a continuous ring round the mat will keep off ants. Sparrows and rats are also fond of the seed and must be guarded against.

(*c*). *Sowing.*—The seed should be thickly sown in one or two beds, depending on their length and the quantity of seed to be sown. The beds having been previously levelled and prepared and seed scattered broad cast, a thin layer of fine or sifted soil is sprinkled over and pressed down. The whole is thoroughly watered with a watering can having a fine rose. All exposed and uncovered seed should now be pressed down or covered, where necessary with more fine soil. The beds should now be covered with a layer of lalang, The lalang may be lightly tied down over the beds in windy localities, by means of sticks inserted opposite each other and about 3 feet apart on either side of the edge of the beds and tied across with split rotan or thin creepers. The object of the lalang is to protect the sprouting seedlings from the direct rays of the sun and to prevent rapid evaporation. In the absence of rain, daily watering should be indulged in; the watering should be evenly distributed over the beds.

The plants should commence sprouting from a week to ten days and in 3 months time will be about 4 inches high. No weeding is necessary in seed beds as any attempt at it would only uproot the tender seedlings. If any is done the kebuns should be carefully instructed to cut back the weeds but on no account to pull up any weeds.

(*d*). *Pricking out (I) into Nursery beds or (II) into Tile-pots.*

(I). *Pricking out into Nursery beds:*—Beds in the meantime having been got ready and holes of about 9 inches depth, at least, been made at one foot apart, the seedlings are raised from the seed-bed with balls of earth using a Bengali or Malay spade. If 2 or 3 plants happen to be raised at one time they may be carefully separated, each with its fair share of surrounding soil. They are then transplanted into the holes of the Nursery beds. The Nursery beds should be covered with light atap coverings as quickly as possible, at about 2 feet off the ground to facilitate future watering. The supports for the ataps and the ataps would be ready cut before commencing transplanting. The atap covering may be removed after 3 weeks to a month, when the plants have got over the shock of transplanting and the roots have laid hold of the soil. Weeding should be carried out now.

(II). *Pricking out into Tile-pots :*—The method to be described is commended to be adopted in preference to the one above, because of the length of taproot the Casuarina develops. Seedlings 6 inches high often have a descending axis or root of a foot length.

A tile-pot is formed by placing two semi-cylindrical tiles together edge to edge, so as to form a cylinder about 5 inches in diameter and 10 inches length. Square beds of 4 feet 3 inches sides (depending on the diameter of the cylinders are excavated to a depth of one foot depending on the length of tile used) which will hold 100 tile-pots in each bed. All preparations for atap coverings being got ready, the bottom of the beds should be lined with a larger of potsherds to prevent the roots penetrating the soil below and thus confining them within the pots, they will also abort and drain off any excess of water. Now the 3 months seedlings will be raised from the seed-beds and pricked out into these tile-pots each of which may be bound with thin split rotan and previously prepared for their reception by a slight watering. The cylinders are placed together side by side in the excavated beds till they form a honeycomb filling the whole up flush with the surface of the ground. The plants should be watered daily in the absence of rain. The atap covering will be removed when the seedlings are established in the pots. By using pots the root growth of the seedlings is restrained and little or no shock is received in transplanting into the field. All failures can be counted and replaced if possible and the number finally removed into the field can be definitely known.

"Bamboo pots" made by sawing a bamboo up below each successive node, are not to be recommended as they *per se* attract white ants, especially when crowded together. They are also more expensive, requiring to be "split" before final transplanting in the open, whereas tile-pots are merely halved and can be used again.

(*e*). *Protection from Insects.*—Tender or herbaceous, *i.e.*, non-lignified stems are liable to be attacked by crickets and grasshoppers and signs of these should be watched for and the insects driven off.

(*f*). *Pitting and Transplanting into Pits.*—Before pitting the area to be planted should be thoroughly cleared of resam (*Gleichenia linearis*) Sendudok (*Melastoma polyanthum* Bl. and allied species) commonly called Singapore Rhododendrons, Lalang (*Imperata cylindrica*, Beauv.) and other weeds including useless small shrubs;

these being collected into heaps and carefully burnt. Care should be taken that Mengkudu (*Morinda tinctoria*, Roxb.) Leban (various species of Vitex) amongst other small-sized trees be not cut or damaged by the fire as they help to re-afforest or clothe the area, main object.

It is recommended by Mr. RICKETTS that "yard-cube" pits be dug, *i.e.*, a square yard at top and bottom and on each side. The advantage claimed being "that the cooly can get into it and dig it out large and square at the bottom, where it is most important for root development." Ordinarily holes 2 feet square at top and one foot square at bottom and if necessary a hole may be made in the centre of the bottom with a crowbar (Malay: Alabangka) will be found to suffice. The holes can be made with a Changkol and the slope towards the bottom trimmed with the "penggali." The best time for planting out is from September to January, once the rains are assured.

Distance of planting. (1). If Casuarina alone is planted, 12 feet by 12 feet should be adopted. (2). If sown in alternate lines, say with Tembusu, 9 feet by 9 feet. (3). Another plan is to plant 6 feet by 6 feet with the intention of subsequently removing every alternate sapling, when it has attained 4 or 5 years' growth. The last is best for windy localities and also for the suppression of lalang-grass. A considerable return may be expected from this thinning. If Mr. RIDLEY'S contention is right that it is resistant to white ants, these saplings may be sold for rafters for building bangsals and for pepper props, for which they would have a ready sale. Probably Carpenter bees (*Xylocopa* Sp.) will not bore into Casuarina so readily as they do into the soft woods usually employed in building bangsals, both because of its hardness and its containing a small quantity of gum resin in its woody structure. (4). Again planting at 12 feet by 12 feet may be adopted with a "quincuncial" plant (Casuarina or Tembusu) at the intersection of the diagonals.

The pits should be dug well before it is meditated to carry out the actual transplanting, and the pits as also the excavated soil turned over, be left fully exposed to the action of the weather. About a fortnight previous to transplanting the pits should be refilled to the ground level with the earth formerly removed from them. It is essential that all the loose earth be returned to the pit so as to form a small mound above the ground level. Earth dug out and weathered occupies about 25 per cent more space than it did in its undisturbed condition underground. This is best undertaken after a slight shower and not when the soil is thoroughly wet, it is difficult to manipulate a wet soil and such soil is apt to harden in drying and interfere with its porosity. The pits may be even filled in dry weather in anticipation of rain.

Presuming a sufficiency of pits has been dug with a large balance in hand an easy matter to satisfy oneself of if tile-pot nurseries are gone in for in the first instance the operation of final transplanting may be carried out after rain overnight. Supposing tile-pot transplants have been raised they will be carried from the nursery to the field in baskets. Here the cylinders will be carefully separated into their component halves. The plants with their surrounding soil will then be carefully inserted into the centre of the pit in an erect natural position and the soil firmly pressed round the roots with the feet. A thorough watering will be given immediately after putting in the plants and if rain holds off a few successive waterings, at intervals of 2 or 3 days, will be of much benefit to the plants. This is quite a simple matter in abandoned mining land where water holes exist. At least four waterings should be given so as to reduce the per centage of failures to a minimum.

(*g*). *Replacing of failures.*—The previous years' failures should be regularly replaced by carefully going over the area in a systematic manner. By the adoption of tile-pot transplants, by which an efficient count can be effected, it should be expected that the failures should not exceed 10 per cent at the outside.

(*h*). *Pruning.*—In the third or fourth year the lower branches may be carefully sawn off to admit light and a free circulation of air. This operation should be carried out with the greatest care and had better be left undone than done badly or roughly. Casuarina stands pruning none too well, witness the length of time a young plant takes to replace a lost leading shoot. Older trees have been known to die back when once their leading shoot is topped, by whatever cause.

(*i*). *Hedging.*—If necessary for fire or wind protection a hedge or belt 20 feet wide should be raised, of Tembusu (*Fagraea fragrans*) or Jambu Ayer Laut (*Eugenia grandis*), preferably the latter which like Tembusu grows readily from seed but withstands damage from fire to a greater extent. Hedging would be carried out only if ground fires from adjoining Lalang wastes are dreaded.

(*j*). *Need of working plan and plan of operations.*—The object of these is that the work shall be carried out in a regular and systematic fashion and a due control be exercised on the results of working. A few points as to method and stages of treatment will now be suggested. As previously remarked careful pruning may be carried out say in the third year. Where the distance of planting is 6 feet by 6 feet alternate plants may be cut out at the fifth year and the thinnings sold for fuel or poles If the plants are 6 feet by 6 feet pruning in the third year may be dispensed with for the alternate plants, to be removed in the fifth year. At least 20 acres should be taken in hand as a "plantation" coupe in any one year and all such coupes should be distinctly separated by cleared lines of a minimum width of 14 feet to allow of two carts crossing each other. It would be better to have a cleared line of 30 feet where fires are dreaded.

Clear felling is the only method suitable for Casuarina, with replanting either with Casuarina or some other trees. Casuarina coppices badly but if cut at 2 to 3 feet above ground it usually gives good shoots; while a few of the trees may be found to have layered naturally by their lower branches. At best these shoots and layers should not be counted on. Self-sown seedlings even in this country where it is indigenous, are found in only favourable localities near the coast and cannot be relied on further inland. Hence clear felling with no reservation of stan lards is indicated.

The rotation is very suitable or ideal localities is as low as 10 years for fuel production; but considering the poorness of the soil in abandoned mining areas 15 or even 20 years may be found nearer the mark. Probably another thinning may be suggested at the 10th year for a fifteen year rotation or 12th year for a 20th year cycle and this intermediate yield sold for fuel.

As a financial first cost it would not be overstating it if from 35 to 40 cents per acre per annum may be expected as nett profit from a regular plantation (*i.e.*, from the area actually planted and not including water holes and fire-traces for example) that is systematically worked.

(*k*). *Inspection by responsible Forest Officer.*—Especially in the early stages of nursery operations and of stocking the area frequent inspections are necessary for the timely correction of mistakes. Inspection is imperative at the commencement and early progress of a stage of work, *e.g.*, at sowing, pricking out, clearing and burning of brushwood on area, pitting and transplanting, replacement of failures and pruning; and on the completion of any such works so as to check the efficiency of the work done and that no gaps in detail have been committed.

R. D. HUDSON.

Singapore, 12th January, 1905.

Coagulation of the Latex of Ficus Elastica.

BY P. J. BURGESS.

Ficus elastica gives a latex which is unlike that from *Hevea Braziliensis* in being acid, and which cannot be converted into marketable rubber by the same means that are adopted in the case of the latter.

This latex has up to the present been difficult to manipulate and the method of treatment which I am about to describe is new, and from experiments made in the laboratory, promises to be quite successful on a large scale. *Ficus elastica* can be made to yield an abundant latex which can be easily collected and which is quite liquid and which appears to remain liquid for an indefinite time.

The best method of tapping this tree is yet to be described, but large yields of clean fluid latex can be obtained and I have recently had ocular proof of that fact and I understand that a description of the method used is to be soon published.

The latex when collected refuses to coagulate, and final resort to boiling the latex has in some cases been necessary. This is troublesome and inefficient, the rubber only separates slowly and very imperfectly.

Shaking or churning has proved useless and the usual coagulants have failed to produce coagulation.

The method I have devised is as follows:—

The latex is warmed to 40° C and a solution of tannic acid of known strength is prepared, the solution I used being of 2 per cent strength. This solution is added to the latex until there is one per cent of tannic acid present in the latex. In the case of a two psr cent solution of tannic acid this will naturally mean the addition of the solution in the proportion of one to 19. The mixture is then gently beaten or churned. Violent agitation leading to the formation of froth should be avoided while simple shaking or stirring is not very efficient.

In one or two minutes the whole mass sets to a cream which on gentle agitation becomes quite coherent and which then may be lifted out by hand, rolled or washed on a washing machine. The coagulation is complete, the liquid remaining being clean or at most faintly opalescent.

This method is quite successful with natural latex, but if the latex be diluted with water the process is more difficult to carry out and more of the tannic acid solution is necessary.

Tannic acid is not corrosive. It is bought in the solid state and the price in London is 2/- a pound. One pound of acid will be sufficient for preparation of 300 to 400 pounds of dry rubber.

This process as described I believe to be quite new and it is essentially a practical process for use on rubber estates.

P. J. BURGESS,
Government Analyst Laboratary.

MISCELLANEOUS.

NOTICES TO SUBSCRIBERS.

1. For the information of subscribers and others who wish to complete their series of Bulletins, notice is given that numbers 1, 7, 8 and 9, of the old Series (1891 to 1900) and Nos. 1, 8, 9 and 10, of New Series, Vol. I (1901-1902) have been reprinted and copies can be had by all whose subscriptions are paid up to date. The cost to others is 50 cents a number.

2. A very large number of subscriptions, even for last year, are yet unpaid although subscribers have received more than one notice of the delay in payment. As this entails a good deal of extra work on the staff, subscribers are asked to send in their subscriptions without delay. Attention is called to the rule that all subscriptions should be prepaid.

3. Subscribers changing their addresses are requested to give notice to the Editor.

4. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 to cover postage.

Meteorological observers are asked to send in their returns to arrive before the 10th day of the following month, if possible, so as to be in time for going to press.

Rainfall for January, 1905:—

The Fort	...	Ins.	1·26
Government Hill	...	,,	3·42
The Prison	...	,,	1·66
Balik Pulau	...	,,	3·22
Pulau Jerejak	...	,,	2·00
Lumut ...	...	,,	2·32
Pangkor ...	...	,,	4·25
Bruas ...	...	,,	3·70

M. E. SCRIVEN,
Assistant Surgeon,
Prison Observatory.

Penang, 9th February, 1905.

SINGAPORE MARKET REPORT.

January, 1905.

Articles.	Quantity sold.	Highest price.	Lowest price.	
	Tons.	$	$	
Coffee—Palembang	...	29.50	29.50	
Bali	...	26.50	26.50	
Liberian	126	27.00	24.00	
Copra	3,004	9.00	8.05	
Gambier	2,770	9.30	8.75	
Cube Gambier, Nos. 1 & 2.	423	14.50	12.50	
Gutta Percha, 1st quality	...	200.00	150.00	
Medium	...	100.00	90.00	
Lower	...	80.00	19.00	
Borneo Rubber 1, 2, and 3	...	138.00	92.00	
Gutta Jelutong	...	7.62½	6.50	
Nutmegs, No. 110's	...	40.00	39.00	
No. 80's	...	62.00	61.00	
Mace, Banda	...	95.00	95.00	
Amboyna	...	76.00	70.00	
Pepper, Black	1,312	29.25	25.75	
White (Sarawak)	324	41.00	39.00	
Pearl Sago, Small	75	4.65	3.80	
Medium	...	...	...	
Large	10	5.50	5.50	
Sago Flour, No. 1	3,980	3.45	3.02½	
No. 2	550	1.22½	1.00	
Flake Tapioca, Small	634	4.50	4.40	Closing fair.
Medium	62	4.75	4.50	
Pearl Tapioca, Small	653	4.40	4.35	
Medium	778	4.25	4.15	
Bullet	15	5.75	5.50	
Tin	3,539	79.50	77.52	

Export Telegram to Europe and America.

For Fortnight ending 15th January, 1905.

Wired at 6 p.m. on 16th January, 1905.

					Tons.
Tin	Str.	Singapore & Penang to	United Kingdom &/or		1,716
Do.	,,	Do.	U. S. A.		796
Do.	,,	Do.	Continent		240
Gambier	,,	Singapore	Glasgow		...
Do.	,,	Do.	London		...
Do.	,,	Do.	Liverpool		100
Do.	,,	Do.	U. K. &/or Continent		375
Cube Gambier	,,	Do.	United Kingdom		110
Black Pepper	,,	Do.	Do.		10
Do.	,,	Penang	Do.		...
White Pepper	,,	Singapore	Do.		40
Do.	,,	Penang	Do.		10
Pearl Sago	,,	Singapore	Do.		25
Sago flour	,,	Do.	London		300
Do.	,,	Do.	Liverpool		1,000
Do.	,,	Do.	Glasgow		...
Tapioca Flake	,,	Singapore & Penang	United Kingdom		250
T. Pearl & Bullets	,,	Do.	Do.		375
Tapioca Flour	,,	Penang	Do.		450
Gutta Percha	,,	Singapore	Do.		5
Buffalo Hides	,,	Do.	Do.		130
Pineapples	,,	Do.	Do.	cases	5,750
Gambier	,,	Do.	U. S. A.		825
Cube Gambier	,,	Do.	Do.		60
Black Pepper	,,	Do.	Do.		100
Black Pepper	,,	Penang	Do.		40
White Pepper	,,	Singapore	Do.		30
Do.	,,	Penang	Do.		30
T. Flake & Pearl	,,	Singapore & Penang	Do.		175
Nutmegs	,,	Do.	Do.		14
Sago Flour	,,	Singapore	Do.		50
Pineapples	,,	Do.	Do.	cases	3,250
Do.	,,	Do.	Continent	,,	1,750
Gambier	,,	Do.	S. Continent		260
Do.	,,	Do.	N. Continent		75
Cube Gambier	,,	Do.	Continent		40
Black Pepper	,,	Do.	S. Continent		35
Do.	,,	Do.	N. Continent		65
Do.	,,	Penang	S. Continent		10
Do.	,,	Do.	N. Continent		...
White Pepper	,,	Singapore	S. Continent		5
Do.	,,	Do.	N. Continent		45
Do.	,,	Penang	S. Continent		20
Do.	,,	Do.	N. Continent		10
Copra	,,	Singapore	Marseilles		280
Do.	,,	Do.	Odessa		580
Do.	,,	Do.	Other S. Continent		300
Do.	,,	Do.	N. Continent		400
Sago Flour	,,	Do.	Continent		490
Tapioca Flake	,,	Singapore & Penang	Do.		180
Do. Pearl	,,	Do.	Do.		70
Copra	,,	Singapore	England		...

				Tons
Gambier	Str.	Singapore	U. S. A.	...
Cube Gambier	,,	Do.	Do.	..
T. Flake & Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	.
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	.
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	.
Pineapples	,,	Singapore	Do.	...
Nutmegs	..	Do.	Do.	.
Black Pepper	..	Do.	Do.	.
Do.	,,	Penang	Do.	..
White Pepper	,,	Do.	Do.	.
T. Flake & Pearl	,,	Do.	Do.	.
Nutmegs	..	Do.	Do.	.

1,500 tons Gambier } Contracts.
440 ,, Black Pepper }

Export Telegram to Europe and America.

For Fortnight ending 31st January, 1905.

Wired at 4.40 p.m. on 1st February, 1905.

					Tons.
10	Tin	Str.	Singapore and Penang to	United Kingdom &/or	1,475
11	Do.	,,	Do.	U. S. A.	801
12	Do.	,,	Do.	Continent	205
13	Gambier	,,	Singapore	Glasgow	...
14	Do.	..	Do.	London	..
15	Do.	,,	Do.	Liverpool	...
16	Do.	..	Do.	U. K. &/or Continent	825
17	Cube Gambier	..	Do.	United Kingdom	...
18	Black Pepper	,,	Do.	Do.	10
19	Do.	,,	Penang	Do.	...
20	White Pepper	,,	Singapore.	Do.	85
21	White Pepper	..	Penang	Do.	20
22	Pearl Sago	,,	Singapore	Do.	50
23	Sago flour	,,	Do.	London	100
24	Do.	,,	Do.	Liverpool	...
25	Do.	,,	Do.	Glasgow	..
26	Tapioca Flake	..	Singapore & Penang	United Kingdom	140
27	T. Pearl & Bullets	,,	Do.	Do.	85
28	Tapioca Flour	,,	Penang	Do.	850
29	Gutta Percha	..	Singapore	Do.	10
30	Buffalo Hides	,,	Do.	Do.	70
31	Pineapples	,,	Do.	Do.	Cases 1,250
32	Gambier	..	Do.	U. S. A.	350
33	Cube Gambier	..	Do.	Do.	10
34	Black Pepper	..	Do.	Do.	180
35	Black Pepper	,,	Penang	Do.	10
36	White Pepper	,	Singapore	Do.	50
37	Do.	,,	Penang	Do.	..
38	T. Flake & Pearl	..	Singapore & Penang	Do.	35
39	Nutmegs	..	Do.	Do.	1
40	Sago Flour	..	Singapore	Do.	..

					Tons.
41	Pineapples	,,	Singapore	U.S.A.	Cases 400
42	Do.	,,	Do.	Continent	,, 1,750
43	Gambier	,,	Do.	S. Continent	95
44	Do.	,,	Do.	N. Continent	75
45	Cube Gambier	,,	Do.	Continent	60
46	Black Pepper	,,	Do.	S. Continent	95
47	Do.	,,	Do.	N. Continent	75
48	Do.	,,	Penang	S. Continent	20
49	Do.	,,	Do.	N. Continent	...
50	White Pepper	,,	Singapore	S. Continent	10
51	Do.	,,	Do.	N. Continent	50
52	Do.	,,	Penang	S. Continent	...
53	Do.	,,	Do.	N. Continent	10
54	Copra	,,	Singapore	Marseilles	340
55	Do.	,,	Do.	Odessa	...
56	Do.	,,	Do.	Other South Continent	...
57	Do.	,,	Do.	N. Continent	400
58	Sago Flour	,,	Do.	Continent	100
59	Tapioca Flake	,,	Singapore & Peneng	Do.	200
60	Do. Pearl	,,	Do.	Do.	280
61	Copra	,,	Singapore	England	...
62	Gambier	,,	Do.	U. S. A.	...
63	Cube Gambier	,,	Do.	Do.	...
64	Flake and Pearl	,,	Do.	Do.	...
65	Sago Flour	,,	Do.	Do.	...
66	Gambier	,,	Do.	S. Continent	..
67	Copra	,,	Do.	Marseilles	...
68	Black Pepper	,,	Do.	S. Continent	..
69	White Pepper	,,	Do.	S. Continent	...
70	Do.	,,	Do.	U. S. A.	...
71	Pineapples	,,	Do.	Do.	..
72	Nutmegs	,,	Do.	Do.	...
73	Black Pepper	,,	Do.	Do.	...
74	Do.	,,	Penang	Do.	.
75	White Pepper	,,	Do.	Do.	...
76	T. Flake & Pearl	,,	Do.	Do.	...
77	Nutmegs	,,	Do.	Do.	..

1,050 tons Gambier } Contracts
675 ,, Black Pepper }

Singapore.

Abstract of Meteorological Readings for the month of January, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·932	145·8	79·7	88·9	73·9	15·0	76·1	·888	73·5	78	N.E.	4·93	1·40
Botanic Gardens	...	...	...	...	...	...	...	...	...	...	...	3·70	1·50

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL,
Principal Civil Medical Officer, S.S.

Kandang Kerbau Hospital Observatory,
Singapore, 21st February, 1904.

Penang.

Abstract of Meteorological Readings in the Prison Observatory for January, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Criminal Prison Observatory	29·906	149·0	79·9	89·4	73·2	16·2	74·9	·767	70·06	69	N. W.	1·66	0·85

Colonial Surgeon's Office,
Penang, 10th February, 1905.

M. E. SCRIVEN,
Assistant Surgeon.

T. C. MUGLISTON,
Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for the month of December, 1904.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Durian Daun Hospital	29·901	143·7	81·0	86·7	73·5	13·2	76·9	·879	72·2	83	N.E.	6·49	1·37

Colonial Surgeon's Office,
Malacca, 28th January, 1905.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of January, 1905.

District.	Maximum in Sun.	Temperature.				Hygrometer.			Total Rainfall.	Greatest rainfall during 24 hours.
		Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	151	81·18	91	68	23	76·18	837	78	11·27	2·67
Kuala Kangsar ...	...	80·29	92	67	23	75·84	833	80	6·49	1·32
Batu Gajah ...	169	80·19	92	67	23	75·45	817	79	8·68	2·53
Gopeng ...	...	79·94	92	63	27	75·56	826	81	14·22	2·64
Ipoh ...	...	80·26	93	69	21	76·44	860	83	5·06	0·96
Kampar ...	...	...	91	68	22	...	...	...	22·10	3·00
Teluk Anson ...	...	80·42	90	70	19	75·48	817	78	4·87	1·40
Tapah ...	..	80·30	92	63	27	75·64	825	79	12·19	1·71
Parit Buntar ...	...	81·21	81	69	10	76·59	852	80	3·46	2·20
Bagan Serai ...	...	81·84	91	68	22	76·75	852	79	4·17	1·39
Selama ...	...	81·68	91	69	18	76·97	865	80	8·84	3·6

STATE SURGEON'S OFFICE,

Taiping, 14th February, 1905.

M. J. WRIGHT,

State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of December, 1904.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·881	146·8	80·4	89·7	71·8	17·9	76·2	0·824	73·4	79	Calm.	8·47	1·93
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	11·94	1·90
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	4·01	0·75
,, Klang	...	...	...	86·8	71·2	15·6	...	...	...	...	...	12·27	1·70
,, Kuala Langat	...	...	...	85·2	72·3	12·9	...	...	...	...	...	18·22	3·28
,, Kajang	...	...	...	90·7	72·3	18·4	...	...	...	...	...	4·17	0·49
,, Kuala Selangor	...	...	...	85·8	74·6	11·2	...	...	...	...	...	11·39	1·57
,, Kuala Kubu	...	...	...	87·4	71·5	15·9	...	...	...	...	...	2·82	0·74
,, Serendah	...	...	...	90·1	75·5	14·6	...	...	...	...	...	5·75	1·24
,, Rawang	...	...	...	83·6	69·3	14·3	...	...	...	...	...	10·40	2·83
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	9·34	2·00
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	..	16·20	2·20

State Surgeon's Office,
Kuala Lumpur, 27th January, 1905.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Muar.

Abstract of Meteorological Readings for the month of January, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Lanadron Estate ...	...	...	81°	90°	71°	19°	74°	...	...	...	...	4·27	1·41

Muar, 11th February, 1905.

ROGER PEARS.

The Duff Development Concession Limited, Kelantan.

Abstract of Meteorological Readings for the month of January, 1905.

District.	Temperature.			Rainfall.	
	Mean Maximum.	Mean Minimum.	Mean Range.	Total Rainfall.	Greatest Rainfall during 24 hours.
	°F	°F	°F	Inches.	Inches.
Kuala Lebir ...	88·3	69·1	19·2	4·08	2·35
Manson's Camp, Ulu Liang ...	83·5	69·1	14·4	5·22	1·22
Serasa ...	86·6	70·2	16·4	6·68	3·76
Kuala Kelantan ...	82·6	72·5	10·1	2·57	·67

Kuala Lebir, 7th February, 1905.

JOHN D. GIMLETTE.

METEOROLOGICAL OBSERVATIONS.

Table Showing The Daily Results Of The Reading Of Meteorological Observations Taken At The General Hospital, Seremban, For The Month Of December, 1904.

Date.	Temperature of radiation.						Temperature of radiation.				Wind.		Temperature of evaporation.			Computed vapour tension.			Relative humidity.			Clouds 0 to 10			Cloud and weather initials.			Rain.
											Direction.																	
	9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Sun	Difference sun and shade.	Grass.	Difference shade and radiation.	9 H	15 H	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	21 H	9 H	15 H	21 H	Inches.
	°	°	°	°	°	°	°	°	°	°			°	°		in.	in.											
1	76	79	77·5	82	69	13	118	36	67	2	E.	E.	74·3	73·9	74·1	0·848	0·839	0·843	94	85	89·5	0	0	3	B	B	C	
2	78	87	82·5	82	71	11	120	38	67	4	N.E.	N.E.	72·9	72·9	72·9	·810	·810	·810	84	84	84	0	10	5	B	R	C	
3	77	84	80·5	84	71	13	125	41	68	3	N.E.	N.E.	70·2	70·7	70·4	·739	·751	·745	79	64	71·5	0	2	5	B	B	C	
4	79	86	82·5	87	70	17	150	63	68	2	E.	E.	70·6	69·5	70	·749	·721	·735	75	58	66·5	2	0	2	B	B	B	
5	76	76	76	86	71	15	128	42	68	3	N.E.	N.E.	70·9	74·3	72·6	·756	·848	·802	84	94	89	0	10	2	B	R	B	1·17
6	78	84	81	85	69	16	125	40	68	1	E.	N.E.	69·5	70·7	70·1	·722	·751	·736	75	64	69·5	0	2	2	B	B	B	
7	77	84	80·5	87	70	17	148	61	68	2	N.E.	E.	71·9	75·7	73·8	·783	·883	·835	84	76	80	0	2	0	B	B	B	
8	79	86	82·5	87	72	15	144	57	68	4	N.E.	E.	72·3	74·2	73·2	·793	·855	·824	80	68	74	2	5	5	B	C	C	
9	80	79	79·5	85	71	14	122	37	68	3	N.E.	E.	73·3	73·9	73·6	·820	·839	·829	80	85	82·5	0	10	5	B	R	C	
10	79	83	81	87	72	15	133	46	68	4	E.	E.	72·3	73	72·6	·793	·810	·801	80	72	76	0	5	2	B	C	B	
11	78	84	81	86	73	13	132	46	67	6	E.	E.	72·9	74	73·4	·810	·840	·825	84	72	78	0	0	5	B	B	C	
12	77	85	81	86	73	13	110	24	66	7	N.E.	N.E.	73·6	73·4	73·5	·829	·826	·827	89	68	78·5	0	3	10	B	C	R	1·26
13	77	78	77·5	82	72	10	100	18	66	6	N.E.	E.	73·6	74·6	74·1	·829	·857	·843	89	89	89	2	3	10	C	C	R	·19
14	77	79	78	85	71	14	133	48	68	3	N.E.	N.E.	73·6	73·9	73·7	·829	·839	·834	89	85	87	3	5	2	C	C	B	·09
15	78	79	78·5	82	71	11	125	43	66	5	N.E.	E.	72·9	72·3	72·6	·810	·793	·801	84	80	82	2	5	10	B	C	R	·13
16	80	75	77·5	80	71	9	100	20	66	5	N.E.	N.E.	73·3	75	74·1	·820	·868	·844	80	100	90	3	10	10	C	R	R	·88
17	76	84	80	86	72	14	135	49	68	4	N.E.	N.E.	74·3	74	74·1	·848	·840	·844	94	72	83	3	2	0	C	B	B	
18	74	72	73	78	72	6	85	7	68	4	N.E.	N.E.	72·3	72	72·1	·793	·785	·789	94	100	97	10	10	0	R	R	B	·31
19	76	80	78	85	70	15	110	25	68	2	E.	E.	72·6	71·6	72·1	·801	·775	·788	89	75	82	2	2	0	C	B	B	
20	75	79	77	80	70	10	105	25	68	2	E.	E.	71·6	73·9	72·7	·774	·839	·806	89	85	87	5	5	10	C	C	R	·56
21	74	79	76·5	82	70	12	90	8	68	2	E.	E.	72·3	73·9	73·1	·793	·839	·816	94	85	89·5	3	3	2	B	C	B	
22	79	87	83	88	72	16	138	50	68	4	N.E.	N.E.	70·6	73·9	72·2	·749	·837	·793	75	65	70	2	2	0	B	B	B	
23	76	87	81·5	88	71	18	138	50	68	2	E.	E	72·6	72·2	72·4	·801	·792	·796	89	61	75	2	0	0	B	B	B	
24	80	84	82	86	72	15	110	24	68	3	N.W.	N.	73·3	74	73·6	·820	·840	·830	80	72	76	0	3	0	B	C	B	
25	82	86	84	86	71	16	128	40	67	5	N.E.	N.E.	73·6	76·2	74·9	·830	·904	·867	76	72	74	0	0	0	B	B	B	
26	82	85	82·5	89	71	18	137	48	67	4	N.E.	S.E.	73·6	75	74·3	·830	·873	·851	76	72	74	0	0	10	B	B	R	
27	82	82	84	86	71	15	135	49	68	3	N.E.	S.E.	75·3	75·3	75·3	·877	·877	·877	80	80	80	0	2	10	B	B	R	1·60
28	76	83	82·5	86	69	15	120	34	68	3	N.E.	E	70·9	74·7	72·8	·756	·856	·806	84	76	80	0	2	0	B	B	B	
29	77	85	82	87	70	18	138	51	68	1	S.E.	S.E.	71·9	73·4	72·6	·783	·826	·804	84	68	76	2	5	2	B	C	B	·35
30	76	85	79·5	86	70	16	135	49	68	2	E.	E.	70·9	71·8	71·3	·756	·781	·768	84	64	74	0	2	10	B	B	R	·05
31	79	86	79·5	85	70	15	130	45	68	2	N.E.	E.	70·6	71·6	71·1	·749	·775	·762	75	75	75	2	0	2	B	B	B	

Total 6·59

STATE SURGEON'S OFFICE,
Seremban, 12th January, 1904.

W. L. BRADDON,
State Surgeon.

No. 2.] FEBRUARY, 1905. [VOL. IV.

AGRICULTURAL BULLETIN
OF THE
STRAITS
AND
FEDERATED MALAY STATES

EDITED BY
H. N. RIDLEY, M. A., F. L. S.,
Director of Botanic Gardens, S. S.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.

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SOME FACTS ABOUT GUTTA PERCHA.

Gutta Percha, derived almost entirely from trees growing within six or seven degrees of the equator, is naturally one of the most important products of the Federated Malay States of Perak, Selangor, Pahang and Negri Sembilan. I will endeavour in this article to give a general idea of the subject, under the following heads:—

I. General, species distribution, etc.
II. Measures taken for protection, past and present.
III. Methods of extraction.
IV. Manufacture, adulteration, lines of transit.
V. Properties.

I.—GENERAL.

The word Gutta Percha is derived from the Malay word "Getah", which means any substance such as gum, latex, resin, etc., which exudes from wounds or incisions in the bark of trees. "Percha" refers to the Malay name for Sumatra, "Pulau Percha." Gutta Percha, therefore, originally meant Getah from Sumatra.

Gutta Percha in its pure state may be taken to mean the coagulated latex of trees belonging to the genera *Palaquium* (Syn. Dichopsis, Isonandra) and *Payena*. Inferior Gutta Perchas are yielded also by several species of *Bassia*, and one or two species of *Ficus*, but these will not be discussed here, the object of this article being to discuss the best Gutta Percha producing species, which are also the ones found most commonly in the Federated Malay States.

Mr. CURTIS, in the Agricultural Bulletin of the Federated Malay States and Straits Settlements, has made the following observations:—"*Palaquium*, the tree referred to as "Getah Taban," was "originally described as an *Isonandra*, but subsequently found not "to agree in certain particulars with that genus, consequently a "new genus was created, called *Dichopsis*. Later it was found that

"the characters of *Dichopsis* were identical with those of *Pala-*
"*quium*, which being of older date takes precedence under botani-
"cal etiquette." The best Gutta Percha is yielded by a tree known as "Getah Taban" in these States, of which there are several varieties, *e.g.*:

Taban Merah,	*Palaquium*	*oblongifolium* or *gutta*.
Taban Chaier,	,,	sp.
Taban Puteh,	,,	*pustulatum*.
Taban Baik,	,,	sp.
Getah Sundik,	*Payena Leerii*.	

All these are good, except Taban Puteh which is much inferior to the others. Considerable doubt exists amongst botanists as regards to the specific names of numbers 2, 3 and 4, and ***P. oblongifolium*** and *P. Gutta* are by some considered as distinct species. Local names cannot be depended on at all, as they differ in the different States. *Payena* is not found in anything like such quantities as *Palaquium*, and it is chiefly with the latter that I propose to deal.

Palaquium Gutta is found in all four States, the best areas lying between 2 degrees and 5 degrees North. It must be considered as a dominant species, but exists at present, owing to the unregulated and wholesale fellings by natives some years ago only in the seedling and small pole stage.

It occurs most frequently on the low hills and plains, often on steep hill sides, and up to 2,000 feet above sea level and even 3,000. It is found well represented in large blocks of forest, varying in size from a few hundred acres to 10,000 or 15,000 acres in extent, while it may be practically absent in other areas for long distances. On close examination a great many of the young plants are found to be stool shoots, but there are many seedlings also, although seed trees are not now to be found. This looks as if the felling of mature trees did not cease till comparatively recently. The Taban tree is a shade bearer of the most pronounced description, and is able to maintain the struggle for existence successfully, if slowly, in these dense evergreen forests. They grow to a considerable size, the largest I have actual knowledge of in this country was in Penang, and measured when blown down 52 feet in height and 42 inches in circumference at 14 feet from the ground. I have seen mention of a tree 140 feet high in the Philippines, and there is no doubt that it is an exceedingly slow grower. At present poles 30 to 40 feet high are fairly common in these States, but large trees are rarities. In the Straits Settlements *Palaquium* only exists in the natural state to a very small extent, *e.g.*, in Malacca near Nyalas, not to mention a few scattered trees in Penang and elsewhere. We must rely in the Colony on our plantations or on the Federated Malay States, where large areas are found containing this plant in the wild state. At present a small plantation exists at Batu Ferringhi in Penang and another in Malacca and Singapore. The *P. Gutta* tree is very easily recognised by its leaves, which are coriaceous, oblong or obovate oblong, and obtusely acuminate; in colour they are of a beautiful coppery gold colour on the under surface, and dark glossy green on the upper. In a mature tree the leaves are about two inches long, but much longer in the young plant. In the forests this tree appears to be very free from the attacks of disease, the only one I have seen being in plantations, and caused by the larva of a moth which I believe to be *Rhodoneura*, sp. This larva eats the young shoots and leaves, and has done appreciable damage in Malacca.

II.—MEASURES OF PROTECTION.

The qualities of Gutta Percha became known about 1845, and the demand steadily increased from that time, till in the seventies there was a rush for it by the natives of these States, the price rising rapidly till 1902. Between 1895 and 1900 the exports from Singapore rose from 2,642 tons to 5,831 tons. It may safely be said that from 1890 onwards the natives of these States were doing their best to obtain Gutta Percha. Their method of extraction consisted in felling every tree they came across and extraction of the latex in a wasteful rough and ready manner, so that by the time the authorities awoke to the fact that Palaquium was being wiped out (about 1898), it was too late to save trees large enough to produce Gutta Percha. It is difficult to see how this could have been prevented, however, as at the time there was no properly organised Forest Department, and whatever measures might have been adopted it would have been impossible to effectively carry out in these dense unpopulated, evergreen forests.

In Perak the export of Gutta Percha was prohibited in 1881, but allowed again in 1887, the issue of passes to collect being prohibited in 1900. The first timber rules, published in 1898 by the British Residents of the various States, contained a protective measure which was to the effect that no rubber bearing tree should be felled if of less than 8 inches diameter. This rule could not, I imagine, be enforced in practice, owing to want of an organised staff. In 1899 and 1900 the matter was taken up by the High Commissioner and the Resident-General, and in the latter year the British Resident, Pahang, issued orders to all his officers to do all that lay in their power to prevent the destruction of Gutta Percha producing trees.

The question of planting was also discussed, but not in a very practical manner.

The Forest Department was started in each State by the appointment of a local man, in Perak in 1895, in Selangor in 1898, in Negri Sembilan in 1899, and in Pahang not till 1902, when a member of the Indian Provincial Forest Service was sent over on deputation at my request, I being deputed from India in October 1901, as Conservator of Forests.

Early in 1902 I suggested that an export duty of 80 per cent *ad valorem* be imposed on all Gutta Percha leaving these States, as a means of putting a stop to the extraction and collection of this product, a considerable period of absolute rest being obviously indicated for all Gutta Percha producing trees. This recommendation was acted upon.

The rules were also amended and the felling of trees for the extraction of the latex was prohibited. In addition to these precautions departmental instructions were issued to the effect that no licences for the extraction of Gutta Percha were to be issued. At the present time therefore it must be difficult to collect Gutta Percha and export it in sufficient quantities to make it pay. That a certain amount of smuggling goes on, I have no doubt, from the fact that 2 or 3 cases have come to light in which Chinamen were found in possession of small quantities and were convicted of the offence. Since 1902 the staff of the Forest Department has been greatly increased, and I have reason to believe that the Government have done and are now doing all that is in their power to assist in the preservation of this valuable product.

As regards measures for protection from other causes of destruction, such as alienation of land for mining and agriculture, the only plan is to reserve all the valuable Palaquium areas, constituting them forest reserves wherever possible, without interfering with valuable tin bearing land. We already have an area of about 60,000 acres reserved, fairly rich in young Palaquium chiefly in Perak and Selangor, and probably as much more remains to be taken up in Pahang and elsewhere.

Again before any large area of land is alienated the department is referred to, and if alienation takes place in spite of the presence of Palaquium we are given the opportunity of taking away the young plants and transplanting them into reserved areas. In the course of time, when all forest reservation has reached its natural limit, Palaquium is bound to disappear from areas outside, nor does this matter, as it is only practically possible to watch defined areas when placed completely under the control of the Forest Department.

The exploitation of the Gutta Percha areas will only be possible in reserved forests in a regular manner, areas being taken in hand annually.

The natural regeneration of Palaquium as already stated is very good, but growth is slow and assistance must be given. Our object now is to encourage only the best species, *P. oblongifolium* and *Gutta*. Regular plantations, *i.e.*, planting in cleared areas from seed is at present impossible in these States as no seed is available. The method followed by the Forest Department here is to cut lines through the dense undergrowth in the forest reserves, taking up regular areas in turn, and to transplant into these lines young Palaquium seedlings taken from outside the reserve in forests that cannot for various causes be protected, or taken from groups inside the reserve where they are growing too close together. At the present time we have an area more than 1,000 acres so planted in Selangor.

In the Trollah reserve in Perak, Palaquium seedlings are so numerous in the seedling and pole stage, that planting over a considerable area is unnecessary. Here we resort only to improvement fellings transplanting young plants into blanks only where ever necessary. The improvement fellings consist in clearing away undergrowth interfering with young Palaquium plants, the operation being repeated yearly or once in several years as may be necessary. By this means the rate of growth of the young trees is greatly increased. I have found the effect of this process to be very beneficial, even in the two years since it was started. By such simple methods as these it is hoped in a few years to have a very considerable area of young Palaquium trees, about 40 to the acre. One advantage in this system is the freedom from the attacks of insects to which trees grown in pure plantations are liable. A similar area to that in Selangor exists in Malacca, but the plants are put in closer together and were obtained from Sumatra. Similar plantations exist at Bukit Timah in Singapore and at Batu Feringhi in Penang, but on a small scale.

III.—METHODS OF EXTRACTION.

The latex of Palaquium exudes immediately on tapping, *i. e.*, cutting the bark, and consists of a milky looking white fluid, in young trees rather thin. It coagulates very quickly and turns in the case of "Taban merah", *P. gutta*, a light pink colour when hard. This is doubtless due chiefly to the fact that the under side of the bark of this species is reddish and small pieces of the bark get mixed up with the latex while it is being rolled off. The rapid coagulation and the fact that the tree only bleeds for a very short time from the cut, are at the root of the disastrous system of extraction of the latex, *viz.*, by felling the tree, tapping the living tree as with Para rubber, being it was supposed impracticable.

The native method is to fell the trees and to cut ring-like incisions round the fallen trunk at intervals of about 9 to 12 inches or even less. These are quickly filled by the latex, and in about half an hour the pure Gutta Percha can be rolled off on sticks. The product is then boiled and shaped as desired, but many impurities are included such as chips of wood, bark, dirt, etc.

This process is of course very wasteful, as a good deal of latex falls to the ground; the latex which is contained immediately underneath the cut and touching the ground is also inaccessible. Again the Gutta Percha contained in the leaves and remaining bark and in the twigs is not collected, and as will be seen later on this is a very considerable amount.

The same method is applied to Getah sundik, *Payena Leerii*, which produces a very white Gutta Percha. Extraordinarily little Gutta Percha is produced by this means.

Dr. SHERMAN, in the Philippines, estimated that only $\frac{1}{35}$ of the total quantity contained was extracted by natives, and from other experiments it is said to be certain that not more than $\frac{1}{10}$ is obtained.

In Penang in 1900 a tree was felled 39 inches in circumference at 5 feet from the ground, with a height of 55 feet, height to the first branch being 35 feet. This tree was thought to be about 50 years old. The Gutta Percha was extracted by the above mentioned native method under the personal supervision of the Superintendent of the Botanic Gardens, and yielded only 1½ lbs. of Gutta Percha. Another tree blown down in 1901, 52 feet high and 42 inches in circumference, yielded by the same method 1⅓ lbs. only. Dr. SHERMAN had a tree felled in the Philippines, 160 feet in height and 8 feet in circumference, which yielded only 8½ lbs., whereas he estimated that could all the latex in the leaves and bark have been obtained he would have extracted 150 to 200 lbs.

Other methods of extraction have been tried, *e.g.*, from the leaves and bark. The green leaves of the best species of Palaquium contain up to 3 per cent of pure Gutta Percha and the bark about 5 per cent. A company was started in Singapore which, by simple mechanical means, extracted Gutta Percha from them, but I believe that great difficulty was met with in the procuring of sufficient leaves. I believe this method of extraction could be employed in the native States were the necessary plant set up close to the forest. Extraction can also be effected from dried leaves by this method, but there is great loss through oxidisation while drying gradually.

There are also various methods of extraction of the latex by chemical means, but I believe I am right in saying that these are less satisfactory as regards the produced Gutta Percha. I am very doubtful whether extraction from the leaves only, *i.e.*, from leaves gathered from standing trees without tapping the tree, would be a success from an economical point of view. From what we know the best method would seem to be to fell the tree, but to extract every ounce of latex from the bark, twigs and leaves of the felled tree. This would not present any great difficulties. In any case it is obvious that the method of collection from leaves only is a most dangerous one if carried out by natives as they cut down the young saplings in order to reach the leaves, otherwise inaccessible without great trouble, whereas were they collecting by their own methods it would not pay to fell trees of less than a certain size. Again Palaquium appears to be a very slow growing tree and what effect the stripping of some or all of the leaves, even at considerable intervals would have, is very uncertain. So far the Forest Department in the Federated Malay States has not concerned itself greatly with methods of extraction, all its energies must for the present be devoted to the protection and cultivation of the trees. There is ample time in which to make experiments. Lately some fairly large trees have been found in the forests and I intend before long to make experiments in tapping the living trees; it is quite possible by tapping the tree from the base upwards to a considerable height a good quantity of latex may be obtained without seriously affecting the vigour of the tree. Of this however I have no great hopes as as I have heard that tapping as hitherto attempted has had an injurious effect.

I may here mention that from the leaves of *P. pustulatum*, which I sent to Singapore, but very little Gutta Percha could be extracted, in fact practically none at all. From P. gutta, however, over 2 per cent was obtained, but I am informed that the Gutta Percha so obtained is not of the first quality and will not do for cables.

IV.—MANUFACTURE AND TRANSIT.

According to M. COLLET who published a pamphlet on the subject nearly all the Gutta Percha of commerce goes to Singapore, where it passes through the hands of Chinese middlemen, the cleverest adulterators in the world. To such an extent has adulteration been carried on that the finished article they turn out resembles but slightly pure Gutta Percha as taken from the tree, and he adds "it is impossible to determine the origin of the Gutta Perchas comprising the reboiled of Singapore." This is greatly to be regretted and I feel sure that the present enormous fall in price is partly accounted for by the adulteration to which this product has been subjected. As will be seen further on the prices lately quoted in Singapore for Gutta Percha are less than those current for very ordinary India rubber of low grade. It is a well known fact that the exports of Gutta Percha from Singapore greatly exceeded the imports. This is however partly explained by the fact that very inferior "getahs" such as "Jelutong," (*Dyera costulata*) are shewn when imported as inferior India rubbers, and when mixed with Gutta Percha and exported as such. "Jelutong" can hardly be called a Gutta Percha however and this only bears out my statement. Whereas the price of Gutta Percha rose in 1902 to $600 per pikul, one pikul=133⅓ lbs., the average price of getah Jelutong is only $6.50. Gutta Percha also finds its way into Singapore under the name of India rubber, also a certain amount is probably brought in by passengers and smuggled through, in small quantities at a time.

V.—PROPERTIES OF GUTTA PERCHA.

As is generally known pure Gutta Percha, when heated, becomes soft, malleable and plastic, but when allowed to cool it becomes hard, retaining any shape given it when hot. Pure Gutta Percha is so hard that it would be difficult to drive a nail into it when in the cool state. In composition it differs from India rubber more physically than chemically. It burns freely with a very characteristic odour. When exposed to air for any length of time it oxidises, when its insulating qualities and durability decrease, but if kept in water its duration is indefinite.

Acids do not affect it unless concentrated.

Its chief value of course arises from the fact that it is unaffected by sea water; this and its insulating qualities make it invaluable for submarine cables.

The chemical composition according to W. P. BRANDT is as follows:—

Carbon	...	86·36
Hydrogen	...	12·15
Oxygen	...	1·49
		100·00

Its physical composition according to PAYEN :—

Gutta	..	78·82	
Albane	...	16·14	(crystalline resin)
Thiarin	...	5·04	
		100·00	

It is a great pity that in Singapore and in the Malay States generally the term *Gutta* is used indiscriminately to mean either India rubber or Gutta Percha, as this leads to great inaccuracy in returns.

SOME FACTS ABOUT THE TRADE.

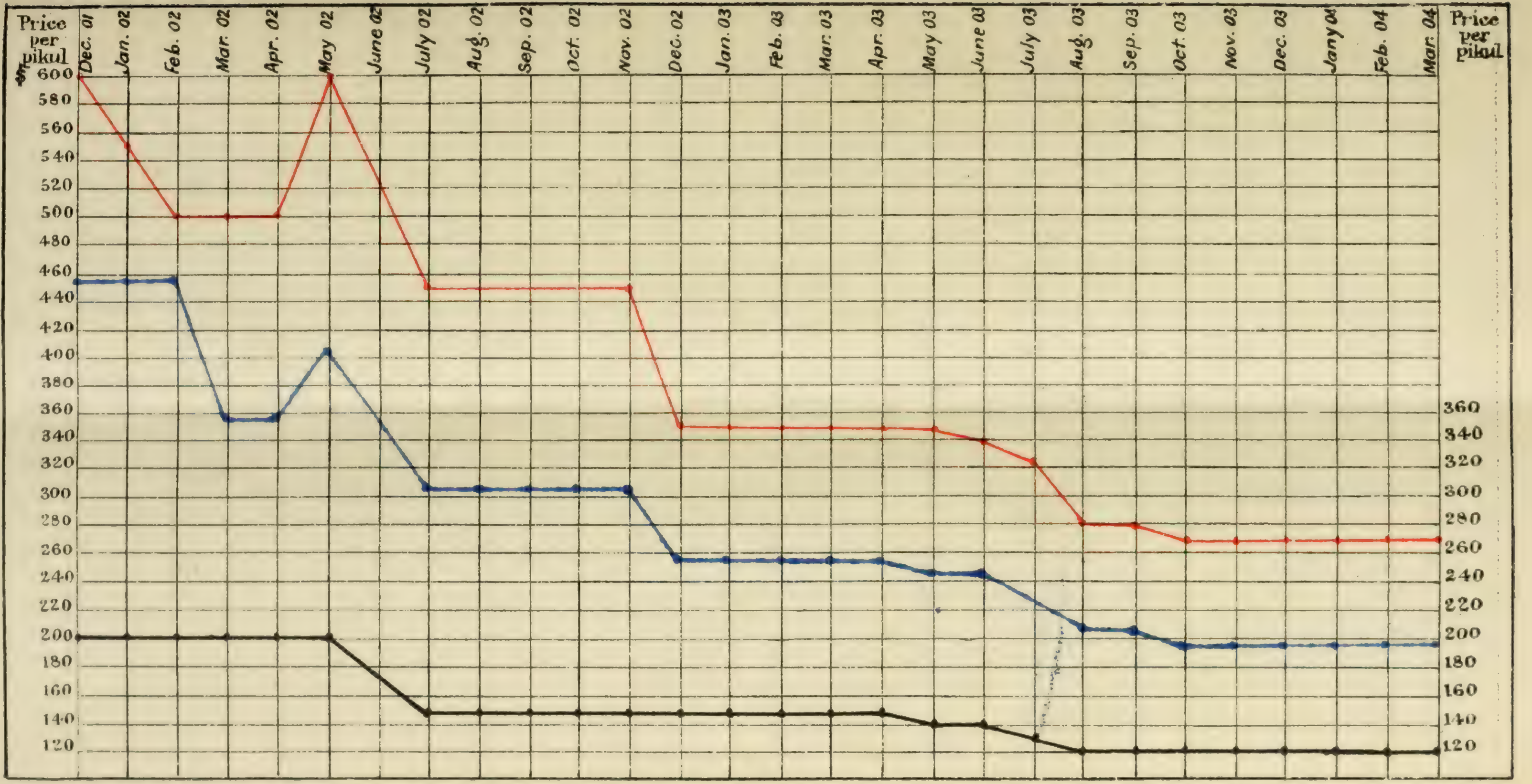
In 1880 Great Britain imported from the Straits Settlements 68,862 cwts. of Gutta Percha valued at £505,821, while in 1870 the imports were only 19,665 cwts., and in 1878, 49,387 cwts. Thus it would seem that the rush for this product came on between 1876 and 1880, or within the last 28 years. In 1890 the price was 3/6 per pound, but rose to $4.60 in 1902.

The exports from Singapore for the last 18 years are as follows :—

1886	Pikuls	33,946	1895	Pikuls	43,910
1887	Do.	25,539	1896	Do.	43,769
1888	Do.	23,717	1897	Do.	45,417
1889	Do.	59,493	1898	Do.	93,398
1890	Do.	78,930	1899	Do.	78,343
1891	Do.	54,026	1900	Do.	97,399
1892	Do.	41,990	1901	Do.	73,815
1893	Do.	38,045	1902	Do.	63,559
1894	Do.	42,841	1903	Do.	35,661

The question which naturally forces itself on one's mind is, will there be any demand for Gutta Percha by the time the Federated Malay States' forests have been given time to recuperate, and will the price ever reach the high one of 1902. A substitute may be invented or submarine cables may become unnecessary; either of these two contingencies failing it is difficult to see why the demand should not be even greater than heretofore. In this case it will be advisable for the Government to transmit its Gutta Percha direct to agents or manufacturers at home, and above all not to send it to Singapore to be changed beyond all recognitions by the Chinese middlemen. Appended is a statement of the highest prices of three qualities of Gutta Percha exported from Singapore during its zenith and decline. I am told that this decline of first quality is largely due to the falling off of the demand for the best quality owing to the cessation at present of work on laying cables, but do not think this the only cause.

A. M. BURN-MURDOCH.



Red. Gutta percha I quality.
Blue. ——— „ ——— medium } highest price earned
Black. ——— „ ——— lower.

TIMBER TRADE IN THE DINDINGS.

In the Dindings the principal species utilized for Timber are as follows:—

Class I B.—Meranti, Niato, Medang, Manggis Hutan, Merawan and Grongang.

Class II.—Septiere, Balong Ayam, Durian Hutan, Jelutong.

Some of the trees due to a complete overhead leaf canopy resulting in a thick layer of undecomposed leaves, fail to show a better seedling growth. Admission of light by interruptions in the canopy seems advantageous as is evidenced in coupes where adjacent trees are in bearing.

The only drawbacks to a representative pole crop is that these parts have never as yet been allowed a sufficient period of rest for the seedlings to establish themselves as frequent fellings over the same area have left their traces on the present constitution of the forests.

Chengal, Damar Laut, Petaling, Resak and other hard wood poles are also sadly wanting as they were not only much in demand for the construction of the native houses, fencings, fishing stakes, masts etc., locally, but also formed an export for ages past.

The Crown lands are worked by Chinese kongsis consisting of tindals, clerk, cook, buffalo drivers and the requisite number of timber cutters and sawyers. Licences are issued and the royalty is collected by tonnage (50 cubic feet=1 ton) on the basis of $3 per ton of converted Class I B. timber and $2 for Class II. The trees are marked for felling by the Forest Department and are then logged into 16 feet length if convertible into planks. The logs are trimmed into waney baulks and then sawn into transportable sizes. Buffaloes drag it out over tracks made of jungle rollers laid at right angles to the direction of the path. They are then built into rafts and floated down to the sawyard and hand-sawn, different sized planks, scantlings and battens being extracted so as to completely utilize the wood.

The coolies are paid according to qualifications ranging from $8 to $12 per mensem, whenever possible. "Sinkehs" are employed, the latter being cheap labour. Sawyers and cutters are paid at contract rates. Coolies on daily wages of about 40 cents per day are engaged in clearing paths, building rolling roads, turning over and lifting logs into position for trimming and sawing in the forest. Trimmed logs, if large, are sawn into transportable sizes by the coolies at contract rates, their daily wages being stopped for the time.

Tindals align paths and supervise sawing in the forests and sawyards so that the largest dimensioned planks may be obtained. This requires some skill and is dependent on the peculiar defects in the wood.

All the inmates of the kongsi get free rations consisting of rice.

dried fish, beans and lard, except the sawyers who are charged at 9 cents per day. There is a small garden attached to the kongsi-house where some of the coolies plant up vegetables for their own consumption and sale if possible. Rents for occupation of Crown land at the rate of $1 per mensem are charged and accredited to the Land Department.

The Krani keeps a daily register of attendance and outturn of work. He is also in charge of a small shop and the profits credited to the Towkay.

CONTRACT RATES.

For 16 ft. logs per inch of mean diameter.	*Sawyard Rates.*
(*a*). Felling, logging and trimming 4 cents*	1 ″× 3″×16′= 3 cts. per each.
(*b*). Trimming alone up to 15″ diameter=25 cents	3 × 3 ×16= 6 ,, ,, ,,
Do. 16″ up to 30″ diam. = 30 cts.	4 × 4 ×16= 7 ,, ,, ,,
Do. 31″ ,, 45″ ,, = 45 ,,	¾ × 8 ×16= 7 ,, ,, ,,
Do. 46″ and over = 60 ,,	1 ×10 ×16=11 ,, ,, ,,
(*c*). Sawing into transportable sizes:—	1½ ×10 ×16=13 ,, ,, ,,
2½ cents per inch width, if over 15″ width, 3 cents ...	2 ×10 ×16=14 ,, ,, ,,
	2 × 4 ×16= 5 ,, ,, ,,

* The coolie who assists in logging has to be paid 40 cents per day by the person who is paid at contract rate.

Seven hundred and sixty-six trees of over 6 feet girth were marked resulting in an export of about 2,000 tons of converted timber for the year 1904.

V. P. BORGES.

RUBBER NOTES.

Three biscuits of Para rubber made in the Botanic Gardens were given to Surgeon C. G. MATHEWS, some months ago, who gave them for examination to the Managing Directors of the Victoria Rubber Works, Leith, Scotland, who thought them not as strong tensilely as smoked Para. He considered that "it is a hard fact that smoked or Fine Para is worth from 6*d.* to 9*d.* per lb. more than the same unsmoked. It is increased thereby in tensile strength so much so that it is the only rubber that can be used in the manufacture of elastic thread." He says that such is the demand for rubber at the present moment that he doubts all Malaya being able to produce enough to materially affect the market and says that there is no use haggling with brokers or employing any sort of middleman, for the manufacturers would be only too glad to buy rubber such as was sent direct in any quantity the planters can turn out and further more that his Company alone would be happy to take the entire output of Malaya for the next five years could it be kept up to the standard of the samples sent.

Editor.

FIBRE.

The Government of the Philippine Islands.
Department of the Interior
Bureau of Agriculture,
Manila, P.I.

December 28th, 1904.

Office of The Chief of Bureau,
Senor Don Carlos Juan Schirmer,
Consul de la Republica Argentina, Singapore.

Dear Sir,—I have the honour to acknowledge the receipt of your recent communication relative to fibre cleaning machinery.

The annual export of Manila hemp from the Philippines now exceed two million pikuls, valued at something more than $20,000,000 All of this fibre is cleaned by a slow wasteful process requiring a large amount of labour and giving, in general, an inferior product. There is a great demand for a machine that will clean Manila hemp fibre and a number of American inventors are now endeavouring to perfect such a machine. We also export considerable maguey fibre, while pineapple, murva, and pandang are widely distributed throughout the Archipelago. There is an excellent opportunity in this country for the introduction of fibre-extracting machinery.

I note with interest your remarks concerning the future of Sansevieria fibre. We have received excellent samples of this fibre from different parts of the Philippines and are now experimenting with the plant in our Manila gardens.

I have, etc.,
H. P. EDWARDS,
Fibre Expert, Bureau of Agriculture.

FIBRES.—(*Continued*).

Fourcroyas.—The Fourcroyas are commonly known as green aloes or Mauritius hemp. All are natives of Central America, but several kinds have been distributed as ornamental or fibre plants in different parts of the tropics where they have been cultivated. As a rule, they possess bigger and thinner leaves than the true aloes and the agaves (American aloes) and the leaves are always bright green (excepting a few variegated ornamental varieties) and so are easily distinguished from the blue green foliage of the agaves. Upwards of twenty kinds have been described, but of these only comparatively a few have been utilized as fibre plants. One species *Fourcroya* (or *Furcræa*) *gigantea* produces a strong thick trunk 4 to 6 feet tall. The others, if they produce a stem of any size at all, only develop a short one 6 to 12 inches long. As these plants die after flowering, the development of the trunk really depends on the length of time the plant takes to flower, in other words the length of the life of the plant.

The plants are propagated by bulbils produced in enormous abundance in the axils of the flower spikes after the fall of the flower, but in *F. gigantea* and occasionally in other species of slow growth a few shoots are also produced in the stem below the leaves. The bulbils are planted in nurseries till they are about one foot or a foot and a half across the leaves and then can be planted out. They should be planted not less than six feet apart, in fairly good soil, though some of the species grow well in very poor clayey soil. They prefer full sun if planted in heavy shade, or very damp spots, they make but slow growth, the leaves are small and flaccid. In a good sunny spot the leaves are broad stiff and thick, and attain in some species a length of 8 to 10 feet. When the plant is about a year old, its leaves are ready to cut, only the lowest leaves are taken, three or more at the top must be left or the plant will die. When full grown the plant produces flowers (called "poling"). It throws up a stem several inches through to a height of 12 or more feet above the plant, ending in a spreading loose panicle of numerous white and green flowers. The leaves now droop and wither. The bulbils are produced in the axils of the flower and fall soon in piles on the ground, and then the whole plant, unless by chance it has thrown up suckers, dies completely. The pole or flower stalk, when dry is pithy and pieces of it can be used as razor strops. It is stated that in some places cutting the leaves for fibre making causes the plant to pole very soon. I have no direct evidence of this and it certainly does not occur in most places where it is cultivated. Possibly this only occurs in certain species.

The fruit which is an oblong capsule with thin flat seeds never seems to be produced in this country.

The plant is sometimes grown round estates and railways to prevent cattle trespass and the invasion of wild pigs, deer, etc. Its sharp pointed leaves radiating in all directions effectually prevent animals from crossing it.

The two species most commonly grown for fibre are *F. gigantea* and *F. cubensis*.

F. gigantea is distinguished by its usually producing a trunk four to six feet tall and 6 to 8 inches through and having the leaves thornless along the edge or nearly so.

F. cubensis produces no trunk and the leaves are armed with strong thorns.

Fibre.—The fibre of Mauritius hemp is extracted from the leaves by simply pounding and beating the leaves with water and washing the fibre so extracted or by machinery. The first method is used by natives of India where the plant is largely grown, and the fibre is sent home under the name of Bombay Hemp. It is of very inferior quality.

A number of machines more or less suitable have been invented for the extraction of Mauritius hemp, one of the earliest and best known was Death's machine. It, however, was not altogether satisfactory, and the Hogan Machine which has been lately mentioned in the *Bulletin* seems to be a more satisfactory working machine. Very excellent samples of the fibre of *F. gigantea* were exhibited at the Agricultural Show last year prepared by this machine. Formerly there was a factory and plantation of Fourcroya at Pulau Battam, South of Singapore, where Death's machine was used. It turned out good samples of the hemp, but prices were then low and the death of the manager put an end to the estate. The juice of the leaves is very corrosive, and acts on iron, but is said to produce less effect on cast iron, and none on brass and copper. It is very irritating to the hands and India rubber gloves are required in manufacturing the fibre.

DODGE gives the out-turn of fibre from leaves of *F. cubensis* at from 2.05 to 3.15 per cent of green leaves. In Jamaica (Dr. MORRIS) 366½ lbs. green leaves gave 28 lbs. green fibre weighing 7½ lbs. when dry. This works out at 2.05 per cent of the green leaf. Mr. SCHIRMER in the table of comparison of fibres published below, obtained 8.06 per cent wet fibre which when dry gave 2.69 per cent.

The fibre is white strong and bright somewhat thicker than Murva, and is much in request for bags, cordage, carpets and the like. Its value is approximately £28 per ton, when of good quality. Recent values will be found in recent numbers of the *Bulletin.*

Mauritius hemp is undoubtedly a plant well suited for cultivation in the Malay Peninsula. It is very easy of cultivation requiring very little expenditure and no great amount of labour. It is easily propagated, and gives a very fair proportion of fibre from the leaves. Indeed, it will be seen from the table annexed that it is only approached in this by Karatas, and gives double or more than double what can be obtained from Manila hemp (abaca), common plantain and pineapple. It is easy to work and constantly in demand.

There can be therefore no reason why this cultivation should not be re-introduced on a large scale and with the suitable machine now in use, might give a very good return, either as a permanent cultivation or as a catch crop while rubber is growing. In the latter case if planted round and through the estate along the paths and borders it would also act as a protective hedge against the wild beasts which attack the young rubber plants.—*Editor.*

Result of work with Messrs. Hogan & Co., Limited, Fibre Scraping Machine:

	Wet out of machine from Gross weight of leaves	Wet to dry	Dry fibre, from Gross weight of leaves
Karatas	8·10%	29·16%	2·37%
Abaca (Manila hemp) ...	6·54%	18·18%	1·17%
Pisang (common banana) ...	5·28%	11·49%	0·61%
Pineapple	4·50%	27·77%	1·25%
Aloes (Fourcroya)	8·06%	33·33%	2·69%

ON THE FRUIT USED FOR COLORING BEAN-CHEESE.

Specimens of the fruit used in coloring bean-cheese as described in *Bulletin* were sent to Kew for identification where they were recognized as those of the Chinese Gardenia, *Gardenia florida.*

Editor.

CULTIVATION AND PREPARATION OF PARA RUBBER,

BY

W. H. JOHNSON.

This is a nicely got up little book of 96 pages by the Director of Agriculture on the Gold Coast, and is illustrated with six plates. As at present very little has been done in the Gold Coast in rubber planting, it is natural that this work should be mainly a compilation of papers published in the Malay Peninsula, Ceylon and elsewhere. With respect to the site for the plantation as to whether dry or wet land is best, the author states that many failures have been experienced by planters endeavouring to cultivate the tree in swampy land. The critic does not remember to have heard of any such cases. Recently, a statement has been published saying that the assertion that wild Para rubber grows on swamp land is incorrect and that it grows on high land, but all the best authorities who have had much experience in Brazil, M. BONNECHEAUX, M. CIBOT and others state that the low swampy flooded ground of the Botanic Gardens rubber plantation is exactly similar to the habitat of the plant in Northern Brazil.

I do not think the time has come yet when we can say it thrives equally well on dry soil. No plantations in such ground have been long enough in work to say this. The account of insect and fungoid pests is not quite up to date, and the statement that the Platypus beetle causes a certain amount of damage to trees in the Straits Settlements is somewhat misleading. The insect only attacks dead wood, and will not touch living trees, but more or less hurries up the death of a dying tree. No allusion is made to the canker fungus, or the more serious *Fomes semitostus*, nor to the leaf-fungi, and even *Termes Gestroi*, is barely alluded to. Some of the numerous tapping instruments are described, and the well known Ceylon one is recommended; but this instrument is useful only for trees which have never previously been tapped. It has been found quite useless for old trees, as the bark becomes too hard and irregular for its use. It would have been as well to have explained this. The author gives a long quotation from Dr. WEBER as to the coagulation of rubber with formaldehyde, and attempted to carry out Dr. WEBER'S instructions with Para rubber, and met with a failure as might be expected as one gathers from Dr. WEBER'S account that he was working with castilloa latex. It is well known that Formaldehyde will keep Para rubber latex from coagulating for many months. He suggests smoking the biscuits which has long been done, but somehow manufacturers seem to prefer them unsmoked, and states that artificial heat is not absolutely essential, but hastens the drying process which it does but as unless very slight ruins the rubber and it would have been better to warn planters against using it at all. Taken as a whole the book is a very useful little one for beginners, and contains a number of useful hints. New methods and processes for this work are constantly being discovered or suggested and perhaps a later edition will be full of the very latest information.

RUBBER TAPPING.

AMHERST, LOWER BURMAH,
January 21st, 1905.

The Editor,
Agricultural Bulletin of S. S. and
F. M. S., Singapore.

DEAR SIR,—Referring to the instructive experiments on rubber tapping by Mr. MACHADO in March, April, and again in the latter part of May which were not so satisfactory as the previous tappings owing to the trees being in bloom, I certainly think that you have solved the problem of getting the largest yield with the least injury to the tree, *for young trees especially*, and also of distributing the labor supply which is a very important point to be looked at in the near future. At the same time may I suggest that there were one or two drawbacks to its complete success in proving the value of this method of tapping, *i. e.*,

1. The great difference between the age and girth of the trees selected ranging from 6 to 15 years, and girth ranging from 1′ 8″ to 5′ 1″.

2. As the experiment was not carried out long enough in the best season (*i. e.*, from when the new leaves appear and before the bloom commences) it is as yet uncertain at what number of tappings the largest yield could be obtained.

At the present stage of the rubber planting industry most planters are anxious to know what they may expect to get from 6 to 7 year old trees. Now, as you mentioned (page 46, *Agricultural Bulletin* S. S. and F. M. S.) 25 trees out of two hundred were under two feet in girth and young trees of 6 to 8 years of age. I would propose that you authorize an experiment to be made on these trees, and also invite planters that already have Para rubber trees of about two feet girth more or less to publish their experiments in the *Agricultural Bulletin* for the benefit of the community: personally I would be only too pleased to contribute, but unfortunately my oldest Para rubber trees are only four years old and not ready for tapping.

May I suggest that the experiment may be done something similar to as follows :—

1. Select trees ranging from about 18″ to 26″ mentioning the age.

2. Make 2 or 3 incisions 2″ in length (possibly 3 would be too many on such small trees) commencing the first day at about 6 feet from the ground, and make new incisions daily about one inch under the other cuts so that the tree could be tapped at least 70 times before reaching the base.

3. Mention which kind of tapping tool is found to be the best for making the small incisions. The E. P. & E. Coy.s' patent tapping knife ought to be just the thing for this kind of tapping.

4. Tap between when the new leaves appear and before the bloom commences, and if possible again in September, October.

5. Tap daily, for, (1) by previous experiments of Messrs. ARDEN and DERRY, page 312 and 328, *Agricultural Bulletin* Vol. 1, nothing is gained by allowing an interval.

(2). By tapping daily much confusion would be avoided when working on a large scale.

Feeling assured that such an experiment would be extremely useful to the majority of rubber planters, and would also prove what your first experiment left uncertain, and if planters with available trees of different ages and girth were to tap them, keeping the records separately of trees ranging from 18″ to 24″, 24″ to 30″, 30″ to 36″, etc., we should then find the true value of this method of tapping to compare with others.

I have, etc.,

W. S. TODD.

GLYCINE HISPIDA.

The Soybean, *Glycine hispida*, of which I recently sowed some seeds obtained from a Soy factory, germinated with fair rapidity and grew well on being planted out. It commenced to fruit when only about six inches tall. The flowers are all cleistogamous, that is to say, the petals never develop and the flower never opens but is fertilized by itself in the bud. At the time of fertilization the bud is less than a quarter of an inch long, with a green hairy five-pointed calyx and minute pale blue petals which soon become pale pink and persist without developing further for some time during the ripening of the fruit. The ovary is green and covered with white hairs and the style is decurved on it so that the stigma comes into contact with one of the minute black anthers and is thus fertilized, thus the plant is quite independent of insect agency for its fertilization and would fruit anywhere. It might be worth while seeing the large demand there is for the beans here to try the use of this plant as a catch crop.

I note one enemy it has in the form of a minute black beetle (apparently one of the Halticidæ) which nibbles the leaves and makes small spots on them. I have seen it also on other beans.

Editor.

NOTE ON A PECULIAR FLOW OF LATEX IN A HEVEA.

As a rule, when a Para rubber tree is opened by the herring-bone method, the flow of latex commences immediately and continues for about an hour when it ceases to produce any more. There is a large tree, however, in the Singapore Botanic Gardens, which behaves in a very different manner. When the cuts are opened, no latex or very little appears for from an hour to an hour and a half. It then commences to flow freely for several hours, requiring a cup to be changed several times. Thus when tapped at 5 A. M. it had only just ceased to flow at 1 P. M. All the adjacent trees flowed naturally, and the cause of this curious action is not at all clear. The tree which otherwise altogether resembles those next to it had previously (some years ago) been tapped on the same side.

Editor.

Malay Peninsula Agricultural Association.

A General Meeting.

A General Meeting was held on Tuesday, the 24th January, 1905, at No. 5, Weld Quay, when the following Members were present:—

Hon. J. Turner—*President,* Mr. T. Boyd—*Vice-President,* Mr. L. es Chasseriau, Mr. E. es Chasseriau, Mr. Joseph Moir, Mr. F. O. Hallifax, Mr. John Symes, Mr. D. Douglas, Mr. D.

RITCHIE, Mr. E. M. JANION, Mr. G. STOTHARD, Mr. A. CRAWFORD and Mr. J. SARGANT—*Secretary.*

The minutes of the last meeting were read and confirmed.

The notice calling this meeting was read.

The Secretary read the reply from the Superintendent of Indian Immigrants with reference to a statement made by Mr. HILL, the Protector of Labour, Federated Malay States, to Mr. T. BOYD with regard to recruiting in India.

The President stated that he had interviewed the Resident-General with regard to the free-tickets which were promised to this Association by Sir WILLIAM TREACHER, the late Resident-General, Federated Malay States. Mr. TAYLOR adheres to the decision that these tickets shall be used for labour imported exclusively into the Federated Malay States.

Mr. F. O. HALLIFAX proposed that a letter be sent to the Straits Government asking that similar assistance be given to Planters in the Colony for importing their labour, as the Federated Malay States Government are doing for Planters in the Federated Malay States, and that a copy of the correspondence between the Association and the Federated Malay States Government be attached to the letter. This was seconded by Mr. T. BOYD and carried.

Mr. BOYD proposed that the items Nos. 1 and 2 on the agenda be left in abeyance for the present. If coolies continue to come over in large numbers another meeting can be called to decide the questions. Seconded by Mr. STOTHARD and carried.

Correspondence was read with regard to the contracts of Javanese Immigrants, and the President stated what was being done in the matter which the members considered satisfactory.

The President proposed that the Superintendent of Indian Immigrants be asked to allot to Mr. SYMES, of Bagan Dato Estate, the full number of coolies he has applied for, *i.e.*, 151, by the 30th of June, 1905, say 30 per month, as the free-tickets can only be used up to that date.

Mr. SYMES said if the proportion of women cannot be obtained, he would take men in their place.

Seconded by Mr. BOYD and carried.

Mr. JANION, the Manager of the Chartered Bank, said he had lived some time in Java and Sumatra and was personally acquainted with the Dutch Government Officials in those places, and he would have much pleasure in doing anything in his power to further the interests of the Association in the matter of getting over labourers from Java.

The President thanked Mr. JANION for his kindness in offering his valuable services.

The President proposed that the Association offer two prizes for essays on Rubber, its cultivation, mode of tapping and manipulation, etc. One prize to be for Para rubber, and the other for Gutta

Rambong. He referred also to the series of Agricultural Shows inaugurated by the Government, the next of which is to be held in Penang in August, saying that the Association should use every endeavour not only by its influence as a body of agriculturalists but also individually to make the Show a success.

Mr. STOTHARD proposed that the President with Messrs. BOYD and CRAWFORD form the Committee to go into these matters and arrange who are to be the Judges to award the prizes for the best essays on Rubber.

Seconded by Mr. J. MOIR and carried.

The President said that he was sure we must all hail with great satisfaction the growing interest which was being taken in agricultural matters by the Press of the Colony. Hardworking agriculturalists did not, unfortunately, often bring forward their views in the newspapers, but they fully recognized the necessity for its being done here and appreciated the efforts made in that direction.

He instanced Ceylon, from which country the "Tropical Agriculturalist" and many other valuable publications emanate as being a striking instance of the development of agriculture due in no small measure to the influence of the Press.

MISCELLANEOUS.

NOTICES TO SUBSCRIBERS.

1. For the information of subscribers and others who wish to complete their series of Bulletins, notice is given that numbers 1, 7, 8 and 9, of the old Series (1891 to 1900) and Nos. 1, 8, 9 and 10, of New Series, Vol. I (1901-1902) have been reprinted and copies can be had by all whose subscriptions are paid up to date. The cost to others is 50 cents a number.

2. A very large number of subscriptions, even for last year, are yet unpaid although subscribers have received more than one notice of the delay in payment. As this entails a good deal of extra work on the staff, subscribers are asked to send in their subscriptions without delay. Attention is called to the rule that all subscriptions should be prepaid.

3. Subscribers changing their addresses are requested to give notice to the Editor.

4. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 to cover postage.

Meteorological observers are asked to send in their returns to arrive before the 10th day of the following month, if possible, so as to be in time for going to press.

Rainfall for February, 1905 :—

Government Hill	...	Ins.	2·35
The Prison	...	,,	3·06
Pulau Jerejak	...	,,	·21
Balik Pulau	...	,,	1·61
The Fort	...	,,	1·17
Lumut ...	...	,,	5·72
Pangkor ...	...	,,	3·15
Bruas ...	...	,,	7·07

M. E. SCRIVEN,
Assistant Surgeon,
Prison Observatory.

Penang, 8th March, 1905.

SINGAPORE MARKET REPORT.

February, 1905.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	34.00	29.50
Bali	...	26.50	24.50
Liberian	177	24.00	22.50
Copra	3,064	8.85	7.60
Gambier	914	9.12½	8.75
Cube Gambier, Nos. 1 and 2	182	13.75	12.25
Gutta Percha, 1st quality	...	200.00	150.00
Medium	...	100.00	90.00
Lower	...	80.00	19.00
Borneo Rubber 1, 2, and 3	...	145.00	90.00
Gutta Jelutong	...	7.10	6.75
Nutmegs, No. 110's	...	39.00	38.50
No. 80's	...	61.00	
Mace, Banda	...	95.00	88.00
Amboyna	...	76.00	70.00
Pepper, Black	867	26.55	25.00
White (Sarawak)	220	39.00	38.00
Pearl Sago, Small	95	4.70	4.60
Medium	10	4.50	
Large	...	5.50	
Sago Flour, No. 1	2,712	3.25	3.05
No. 2	25	1.12½	
Flake Tapioca, Small	304	4.50	4.40
(Ex) Medium	...	4.50	4.50
Pearl Tapioca, Small	227	4.40	4.30
Medium	80	4.30	4.15
Bullet	105	5.75	5.75
Tin	1,510	77.37½	76.50

Export Telegram to Europe and America.

For Fortnight ending 15th February, 1905.

Wired at 4.45 p.m. on 16th February, 1905.

				Tons.
Tin	Str.	Singapore & Penang to	United Kingdom &/or	1,300
Do.		Do.	U. S. A.	1,330
Do.		Do.	Continent	285
Gambier		Singapore	Glasgow	...
Do.		Do.	London	...
Do.		Do.	Liverpool	75
Do.		Do.	U. K. &/or Continent	375
Cube Gambier		Do.	United Kingdom	35
Black Pepper		Do.	Do.	25
Do.		Penang	Do.	10
White Pepper		Singapore	Do.	90
Do.		Penang	Do.	...
Pearl Sago		Singapore	Do.	90
Sago flour		Do.	London	225
Do.	,,	Do.	Liverpool	875
Do		Do.	Glasgow	50
Tapioca Flake		Singapore & Penang	United Kingdom	170
T. Pearl & Bullets		Do.	Do.	360
Tapioca Flour		Penang	Do.	400
Gutta Percha		Singapore	Do.	35
Buffalo Hides		Do.	Do.	125
Pineapples		Do.	Do.	cases 20,000
Gambier		Do.	U. S. A.	360
Cube Gambier	,,	Do.	Do.	45
Black Pepper	,,	Do.	Do.	90
Do.		Penang	Do.	30
White Pepper	,,	Singapore	Do.	10
Do.	,,	Penang	Do.	50
T. Flake & Pearl	,,	Singapore & Penang	Do.	175
Nutmegs		Do.	Do.	15
Sago Flour		Singapore	Do.	...
Pineapples		Do.	Do.	cases 2,000
Do.		Do.	Continent	,, 1,000
Gambier		Do.	S. Continent	100
Do		Do.	N. Continent	35
Cube Gambier		Do.	Continent	70
Black Pepper		Do.	S. Continent	160
Do.		Do.	N. Continent	110
Do.		Penang	S. Continent	10
Do.		Do.	N. Continent	...
White Pepper		Singapore	S. Continent	...
Do.		Do.	N. Continent	20
Do.		Penang	S. Continent	...
Do.		Do.	N. Continent	20
Copra		Singapore & Penang	Marseilles	260
Do.		Do.	Odessa	...
Do.	,,	Do.	Other S. Continent	680
Do.	,,	Do.	N. Continent	280
Sago Flour		Do.	Continent	850
Tapioca Flake		Singapore & Penang	Do.	100
Do. Pearl		Do.	Do.	100
Copra		Singapore	England	...

				Tons.
Gambier	Str.	Singapore	U. S. A.	...
Cube Gambier	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	..
Gambier	,,	Do.	S. Continent	..
Copra	,,	Do.	Marseilles	..
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	..
Do.	,,	Do.	U. S. A.	.
Pineapples	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...

500 tons Gambier } Contracts.
500 ,, Black Pepper }

Export Telegram to Europe and America.

For Fortnight ending 28th February, 1905.

Wired at 2.30 p.m. on 1st, March, 1905.

				Tons.
Tin	Str.	Singapore and Penang to	United Kingdom &/or	615
Do.	,,	Do.	U. S. A.	767
Do.	,	Do.	Continent	230
Gambier		Singapore	Glasgow	.
Do.	,,	Do.	London	..
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	U. K. &/or Continent	250
Cube Gambier	,,	Do.	United Kingdom	20
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	30
White Pepper	,,	Singapore.	Do.	80
Do.	,,	Penang	Do.	...
Pearl Sago	,,	Singapore	Do.	...
Sago flour	,,	Do.	London	...
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	Glasgow	...
Tapioca Flake	,,	Singapore & Penang	United Kingdom	190
T. Pearl & Bullets	,,	Do.	Do.	25
Tapioca Flour	,,	Penang	Do.	220
Gutta Percha	,,	Singapore	Do.	15
Buffalo Hides	,,	Do.	Do.	35
Pineapples	,,	Do.	Do.	Cases 10,000
Gambier	,,	Do.	U. S. A.	310
Cube Gambier	,,	Do.	Do.	40
Black Pepper	,,	Do.	Do.	175
Do.	,,	Penang	Do.	120
White Pepper	,,	Singapore	Do.	10
Do.	,,	Penang	Do.	50
T. Flake & Pearl	,,	Singapore & Penang	Do.	350
Nutmegs	,,	Do.	Do.	4
Sago Flour	,,	Singapore	Do.	80

					Tons.
Pineapples	Str.	Singapore	U. S. A.	Cases	4,250
Do.	,,	Do.	Continent	,,	500
Gambier	,,	Do.	S. Continent		50
Do.	,,	Do.	N. Continent		30
Cube Gambier	,,	Do.	Continent		...
Black Pepper	,,	Do.	S. Continent		5
Do.	,,	Do.	N. Continent		...
Do.	,,	Penang	S. Continent		10
Do.	,,	Do.	N. Continent		...
White Pepper	,,	Singapore	S. Continent		...
Do.	,,	Do.	N. Continent		5
Do.	,,	Penang	S. Continent		...
Do.	,,	Do.	N. Continent		10
Copra	,,	Singapore & Penang	Marseilles		...
Do.	,,	Do.	Odessa		...
Do.	,,	Do.	Other South Continent		150
Do.	,,	Do.	N. Continent		100
Sago Flour	,,	Do.	Continent		...
Tapioca Flake	,,	Singapore & Peneng	Do.		85
Do. Pearl	,,	Do.	Do.		50
Copra	,,	Singapore	England		...
Gambier	,,	Do.	U. S. A.		...
Cube Gambier	,,	Do.	Do.		...
T. Flake and Pearl	,,	Do.	Do.		...
Sago Flour	,,	Do.	Do.		...
Gambier	,,	Do.	S. Continent		...
Copra	,,	Do.	Marseilles		...
Black Pepper	,,	Do.	S. Continent		...
White Pepper	,,	Do.	Do.		...
Do.	,,	Do.	U. S. A.		...
Pineapples	,,	Do.	Do.		...
Nutmegs	,,	Do.	Do.		...
Black Pepper	,,	Do.	Do.		...
Do.	,,	Penang	Do.		
White Pepper	,,	Do.	Do.		
T. Flake & Pearl	,,	Do.	Do.		..
Nutmegs	,,	Do.	Do.		

400 tons Gambier } Contracts
450 ,, Black Pepper }

Penang.

Abstract of Meteorological Readings in the Prison Observatory for February, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Criminal Prison Observatory	29·901	155·9	80·1	90·2	72·7	17·5	75·1	·776	70·50	70	N. W.	3·06	1·75

Colonial Surgeon's Office.

Penang, 8th March, 1905.

M. E. SCRIVEN,

Assistant Surgeon.

T. C. MUGLISTON,

Colonial Surgeon, Penang.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of February, 1905.

DISTRICT.	Maximum in Sun.	Temperature.				Hygrometer.			Total Rainfall.	Greatest rainfall during 24 hours.
		Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	153	81·40	92	69	22	76·48	846	78	6·78	1·42
Kuala Kangsar ...	...	80·64	92	68	23	75·18	801	76	5·12	1·24
Batu Gajah ...	162	80·08	94	68	23	75·61	827	80	8·17	2·15
Gopeng ...	...	80·00	92	63	28	75·21	811	79	4·67	1·54
Ipoh ...	...	80·71	92	68	21	77·05	880	85	5·48	0·96
Kampar ...	...	...	89	62	23	...	...	...	8·80	1·47
Teluk Anson ...	...	80·36	91	68	21	76·04	813	81	9·30	2·58
Tapah ...	..	80·40	93	62	26	75·60	825	79	8·95	1·64
Parit Buntar ...	...	81·18	82	68	10	76·61	856	80	4·57	1·70
Bagan Serai ...	...	81·44	91	68	23	76·39	843	78	9·19	2·20
Selama ...	...	81·43	90	69	20	76·53	846	78	6·34	1·65

STATE SURGEON'S OFFICE,

Taiping, 10th March, 1905.

M. J. WRIGHT,

State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of January, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·889	150·4	80·6	89·6	71·0	18·6	76·4	0·833	73·7	·80	Calm.	5·01	1·29
Pudoh Gaol Hospital ,,	...	...	...	...	...	...	...	...	...	...	...	5·64	2·04
District Hospital ,,	...	...	...	...	...	...	...	...	...	...	...	3·55	1·05
,, Klang	...	...	...	86·9	70·9	16·0	...	...	...	...	...	8·33	2·92
,, Kuala Langat	...	...	...	86·2	72·1	14·1	...	...	...	...	...	7·92	2·61
,, Kajang	...	...	...	92·4	71·4	21·0	...	...	...	...	...	6·73	1·68
,, Kuala Selangor	...	...	...	87·7	74·4	13·3	...	...	...	...	...	5·41	1·22
,, Kuala Kubu	...	...	...	90·0	70·7	19·3	...	...	...	...	...	14·37	4·41
,, Serendah	...	...	...	90·1	76·1	14·0	...	...	...	...	...	15·13	6·83
,, Rawang	...	...	...	86·3	69·3	17·0	...	...	...	...	...	7·43	2·13
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	3·51	1·27
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	..	4·64	3·15

State Surgeon's Office,
Kuala Lumpur, 27th February, 1905.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Muar.

Abstract of Meteorological Readings for the month of February, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Lanadron Estate …	…	…	83°	90°	69·5°	20·5°	74·5°	…	…	…	…	4·76	1·26

Muar, 7th March, 1905.

ROGER PEARS.

The Duff Development Concession Limited, Kelantan.

Abstract of Meteorological Readings for the month of February, 1905.

DISTRICT.	Temperature.			Rainfall.	
	Mean Maximum.	Mean Minimum.	Mean Range.	Total Rainfall.	Greatest Rainfall during 24 hours.
	°F	°F	°F	Inches.	Inches.
Kuala Lebir ...	88·6	69·1	19·5	4·81	2·08
Liang ...	85·1	69·0	16·1	7·45	2·16
Serasa ...	89·3	70·2	19·1	5·33	1·17
Kuala Kelantan ...	83·6	72·2	11·4	5·72	1·67

March, 1905.

JOHN D. GIMLETTE.

METEOROLOGICAL OBSERVATIONS.

Table Showing the Daily Results of the Reading of Meteorological Observations taken at the General Hospital, Seremban, For the Month of January, 1905.

Date.	Temperature of radiation.						Temperature of radiation.				Wind. Direction.		Temperature of evaporation.			Computed vapour tension.			*Relative humidity.			Clouds 0 to 10.			Cloud and weather initials.			Rain.
	9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Sun.	Difference sun and shade.	Grass.	Difference shade and radiation.	9 H	15 H	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	21 H	9 H	15 H	21 H	Inches.
	°	°	°	°	°	°	°	°	°	°			°	°		in.	in.											
1	79	85	82	87	74	13	125	38	70	4	E.	E.	68·9	71·8	70·3	0·707	0·781	0·744	71	64	67·5	2	2	2	B	B	B	
2	78	81	79·5	82	73	9	100	18	70	3	E.	E.	71·2	74·2	72·7	·765	·849	·807	79	80	79.5	3	5	5	C	C	C	·23
3	79	79	79	85	71	14	125	40	69	2	E.	S.E.	72·3	72·3	72·3	·793	·793	·793	80	80	80	2	10	5	B	R	C	·18
4	79	80	79·5	86	72	14	140	54	69	3	N.E.	N.E.	72·3	75	73·6	·793	·867	·825	80	85	82·5	3	2	2	C	B	B	·49
5	80	82	81	83	71	12	124	41	69	2	E.	E.	69·9	72	70·9	·732	·785	·758	71	72	71·5	2	0	0	B	B	B	
6	79	86	82·5	87	72	15	140	53	70	2	E.	N.E.	68·9	67·2	68	·707	·681	·694	71	55	63	0	0	0	B	B	B	
7	75	85	80	87	72	15	135	48	70	2	N.E.	E.	64·7	68·5	66·6	·612	·698	·655	70	58	64	0	0	0	B	B	B	
8	76	84	80	89	67	22	148	59	66	1	S.E.	E.	70·9	72·4	71·6	·756	·794	·775	84	68	76	0	3	2	B	C	B	
9	78	83	80·5	87	70	17	118	31	68	2	S.E.	E.	72·9	74·7	73·8	·810	.856	·833	84	76	80	0	3	2	B		B	·39
10	76	84	80	87	71	16	155	68	68	3	E.	S.E.	70·7	74	72·4	·756	·840	·798	84	72	78	2	3	5	B	C	C	·10
11	78	85	81·5	85	72	13	135	50	69	3	E.	E.	72·9	73·4	73·1	·810	·826	·818	84	68	76	2	5	10	B	C	R	2·35
12	76	82	79	83	72	11	127	44	69	3	N.E.	N.E.	72·6	73·6	73·1	·801	.830	·815	89	76	82·5	2	5	10	B	C	R	1·32
13	80	83	83	88	71	17	155	67	68	3	E.	E.	73·3	72·8	73	·820	·808	·814	80	64	72	3	2	5	C	B	C	
14	75	83	79	86	71	15	150	64	68	3	N.E.	N.E.	71·2	69·7	70·4	·765	·724	·744	79	64	71·5	0	0	0	B	B	B	
15	80	87	83·5	88	71	17	148	60	68	3	E.	E.	69·9	70·6	70·4	·732	·749	·740	71	58	64·5	0	0	0	B	B	B	
16	77	85	81	86	69	17	122	36	66	3	E.	E.	71·9	70·1	71	·783	·738	·760	84	61	72·5	0	0	0	B	B	B	
17	82	87	84·5	88	68	20	160	72	66	2	E.	E.	68·6	70·6	69·6	·701	·749	·725	64	58	61	0	0	0	B	B	B	
18	79	89	84	89	67	22	164	75	65	2	E.	E.	70·6	71·1	70·8	·744	·757	·753	75	55	65	0	0	0	B	B	B	
19	78	89	82	90	70	20	158	74	67	3	E.	S.E.	71·2	72.7	71·9	·765	·801	·783	79	58	68·5	0	0	0	B	B	B	
20	79	87	83	88	72	16	150	70	68	4	S.E.	S.E.	72·3	78·8	75·5	·793	·985	·889	80	77	78·5	0	0	2	B	B	B	1·30
21	77	82	79·5	88	72	16	140	62	68	4	S.E.	S.E.	75·3	77	76·1	·877	·926	·901	94	85	89·5	2	10	2	B	R	B	·50
22	80	86	83	88	72	16	150	62	68	4	S.E.	S.E.	75	74·2	74·6	·867	·855	·861	85	68	76·5	0	3	5	B	C	C	
23	79	85	82	89	71	18	130	61	67	4	S.E.	S.E.	73·9	75	74·4	·839	·873	·856	85	72	78·5	3	3	5	C	C	C	·23
24	80	78	79	88	71	17	130	42	67	4	S.E.	S.E.	73·3	74·6	73·9	·820	·857	·838	80	89	84·5	0	10	5	B	R	C	·79
25	78	82	80	85	72	13	157	45	68	4	E.	S.E.	72·9	72	72·4	·810	·785	·797	84	72	78	0	3	0	B	C	B	
26	77	84	80·5	87	72	15	159	70	68	4	S.E.	S.E.	75·3	74	74·6	·877	·840	·858	94	72	83	0	3	2	B	C	B	
27	78	81	79·5	88	71	17	151	71	67	4	E.	N.E.	74·6	76·2	75·4	·857	·897	·877	89	85	87	2	10	10	B	R	R	1·08
28	75	85	80	88	72	16	156	63	68	4	E.	N.E.	73·3	73·4	73·3	·820	·826	·823	94	68	81	0	2	0	B	B	B	
29	76	81	78·5	87	71	16	156	69	68	3	E.	N.E.	72·6	72·4	72·5	·801	·794	·797	89	68	78·5	0	0	0	B	B	B	
30	80	83	81·5	89	72	17	155	66	65	7	S.E.	S.	73·3	69·7	71·5	·820	·724	·772	80	64	72	2	10	10	B	R	R	
31	79	87	83	89	71	18	159	70	68	3	S.E.	S.	77·3	73·9	75·6	·937	·837	·857	95	65	80	0	10	3	B	R	C	·72

Total 9·68

STATE SURGEON'S OFFICE,
Seremban, 17th February, 1905.

W. L. BRADDON,
State Surgeon.

No. 3.] MARCH, 1905. [VOL. IV.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.

AGRICULTURAL BULLETIN

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FEDERATED MALAY STATES.

No. 3.] MARCH, 1905. [VOL. IV.

KUMUS (SHOREA CILIATA).

The timber of the tree commonly known to the Malays as *Kumus* has been known for many years as a valuable wood, but for a long time I was unable to identify it as I could never procure specimens of the leaves, flowers, and fruits by which it could be settled as to what the tree really was. Mr. MOORHOUSE, however, recently sent me specimens of the wood, leaves, and fruit, together with notes concerning the tree which proves to be Dipterocarpous, *viz.*, *Shorea ciliata*, King. Mr. MOORHOUSE writes of it as follows:—

"A large tree with small buttresses about 6 feet high, bark reddish brown, slightly flaky, quarter of an inch thick, average girth of ten selected trees, 22 feet. This is not an uncommon size for mature trees. Height to first branch of tree 80 feet, height of whole tree 150 to 180 feet. The tree exudes a yellowish white damar which is largely collected and mixed with Penak damar, but is very inferior. It is valued at forty dollars a ton. The tree has no sapwood, the timber being hard all through. It has been largely used this year for railway sleepers on the Seremban to Singapore Railway and is most probably used as Chengai or Penak in other States. Malays say it is as good as Penak for houses and they only use Penak in preference, because Penak turns a deep red brown with time and exposure; whereas Kumus turns greyish white and is not so handsome. It is an excellent timber and very plentiful in Kwala Pilah District, Negri Sembilan. Charcoal burners have exterminated it in Seremban, but this business has now been stopped. It makes a first class charcoal."

The specimen of wood sent by Mr. MOORHOUSE is of a light reddish brown colour, fairly heavy. fibres slightly sinuous, the vessels in section conspicuous, and silvery inside with the dammar exudation; rings very irregular in distance and not very conspicuous; medullary rays very fine and close, vessels in transverse section crowded and numerous, pores small in short rows or solitary, irregularly arranged; weight of a cubic foot, 68 lbs., wood very hard.

A section of a young tree, 6 inches through, sent many years ago by Mr. J. S. GOODENOUGH, from Selangor, under the name of Kumus bears a close resemblance to that sent by Mr. MOORHOUSE and is undoubtedly the same tree. There is a band of sapwood round it little more than ½ inch thick and the centre about ¼ inch is softer and pithier wood. The rest of the specimen is strong hard dense timber. The rings are rather more conspicuous, about 19 in number, and rather more regular. This tree was probably about 20 years old, to judge by the rings. It would square to four inches. The timber of this tree may well be reckoned as among the first class timbers of the Peninsula. It seems for its class to be of rapid growth, and is good all through. It closely resembles a timber known now in Singapore as Poonah, which is much in request.

The plant appears to be identical with the *Shorea ciliata,* King.

The twigs in Mr. MOORHOUSE'S specimen are slender and black when dry; leaves young ovate with a distinct blunt point, 2 to 4 inches long, ¾-1¼ inch wide, coriaceous pale above when dry, with about 14 pairs of nerves very inconspicuous above, beneath more conspicuous, and the whole of the underside of the leaf covered with a thin white scurf easily rubbed off, which makes the leaf beneath appear whitish petiole slender, little over ½ an inch long. Older leaves seem to be narrower, lanceolate, acuminate, the nerves more conspicuous, and the white scurf absent; panicles short, 1 to 1½ inch long, peduncles and especially the upper branches of the panicle flexuous, covered with a white scurfy wool; flowers shortly pedicelled, ½ inch long, narrow oblong, from a broader base, pubescent, ½ inch long; "Stamens 30 in fascicles of 3 unequal, the connective produced into an apical process crowned with 3 to 5 cilia." Calyx lobes in fruit, three long narrow blunt, covered with stillate pubescence, two short.

This plant was first collected by Mr. CURTIS in Penang, No. 1578 of his collection, and though Mr. MOORHOUSE'S specimens differ in some respects, I have little doubt as to the correctness of the identification. There are no flowers on the latter. The Penang specimens in flower and fruit have very distinctly reticulate nerved leaves; these of the Seremban specimens have not, but where by injury the leaves have lost the epidermis the reticulations are very conspicuous, and are traceable too in the old leaves.

The foliage of Shoreas varies very much at different times of the year, and at different ages and different forms or states of the leaves properly correlated with those of adult trees, have not yet been collected; many such indeed, as *Shorea ciliata*, have been collected but once. Flowers and fruit are seldom to be met with, and often the trees are inaccessible on account of their great size, so that the study of these most important timber trees is very difficult.—*Editor.*

FIBRES.—*Continued.*

Coco-nut Fibre.—Coir.—This is the fibre of the husk of the coconut beaten out. Although there are extensive coco-nut estates all over the Peninsula and an abundance of husks, there is hardly any coir made in the Peninsula. In Singapore, I have found in one place some Chinese who roughly beat out the husks, and twisted the fibre by hand into very coarse weak rope, which was sold very cheaply for tying up parcels.

In India and Ceylon the coir is extensively prepared and is always in demand for cordage, cables, mats, brushes, etc. The husk is removed from the nut with an iron spike stuck in the ground and the husks are thrown into salt-water tanks for from 6 to 18 months. If fresh water is used it becomes foul and the fibre is discoloured. The tanks are sometimes warmed by steam and this shortens the operation and softens and improves the fibre. When thoroughly soaked the husks are beaten with mallets and rubbed between the hands to get rid of the cellular substance between the fibres. In Ceylon it is said that 40 coco-nuts will produce 6 lbs. of coir; in the Laccadives it is said that 3 large nuts will produce 1 lb. coir measuring 22 fathoms, and 10 small nuts go to about 1 lb., but this will measure 35 fathoms of yarn. A good deal of the value of the coir seems to depend on the age of the fruit as it becomes hard and woody when the fruit is quite ripe. It is therefore cut in the 10th month, if for coir. If cut before it is too weak and if later becomes coarse and hard.

This is perhaps the reason why our local coir is said to be useless. The nuts grown chiefly for copra are allowed to become quite ripe, by which time probably the fibre is so hard and coarse that it is difficult to work it. But an enormous number of nuts here are used young for food. In fact, it often pays the planter better to ship them to India and elsewhere for food than to use them for making copra. The husks of these nuts would well be worth the attention of those interested in fibres, who could easily start a coir factory in Singapore.

Beside the Chinese rope above alluded to the only other manufactory of rope or mats I know of is that of the Gaols where the prisoners are employed in the work.

The cost of the husks in Singapore is about 50 cents a hundred. With the large number of wasted husks in this country, it is possible that some business might be done in coir-making.

Arenga saccharifera, Kabong fibre, Tali Hijau, Vegetable horse-hair:—

The fibre of this palm is well known in the Malay Peninsula and Islands, but is very little known in the home markets as it has been seldom offered for sale and not in sufficient quantities. The palm is common in cultivated ground all over the Peninsula and a wild form grows in Province Wellesley. It is valued for its fibre and also for its sugar, the well known Gula Malacca, used either in the form of molasses or as a kind of Candy.

The fibre is produced from the base of the leaf sheaths, and enwraps the trunk of the tree, its function apparently being to prevent the rain-water entering below the sheaths, and injuring the tree. It is simply pulled off the tree and rolled into bundles, after which it is sorted into sizes, the fibres being very mixed in size, from stiff thick brittle masses into the finest possible thread. The sorting and arranging of these fibres and combing out any dirt there may be among them is all the work necessary in preparing the fibre. Many years ago, Mr. BULKELEY, visiting Singapore, was much struck by this fibre as useful for brushes especially for boiler brushes, as the fibre is not affected by hot water, and an attempt was made to procure a quantity for him, but the business was stopped in its inception owing to the want of a middleman to attend to the necessary work of sorting, baling, and shipping (*See* Bulletin, 1903, p. 403). With the rising interest in fibres of all sorts, however, we may hope that this fibre may eventually form an article of export to the home markets.

The palm is easily grown from seed and in good soil attains a great size in a few years. It lasts for about 20 or 30 years, when it commences to flower from the top downwards, emitting at every joint a large hanging bunch of male and female flowers alternately. The fruit, dull yellow, as big as a small apple, contains three seeds, and are produced in great abundance; when the flowering has nearly reached the base of the tree it dies completely.

In many parts of the Peninsula it grows spontaneously, coming up all over the campongs, and as the plant requires no care it is very common in all the villages.

The fibre, which is quite black, is very strong and durable, and suited for cordage, cables and such work, as it resists sea water very well. There is a piece of a cable in the Sandakan Museum which was found attached to an antique anchor supposed to have belonged to a ship of one of the early explorers of that part of Borneo. The cable seems to be in a complete state of preservation and though now brittle it still retains its form and colour. The Malays make cords for tethering buffaloes, and ornamental work with this fibre, and quite a thin cord will hold the most lively buffalo without breaking.

ROYLE states that a coarse line of this fibre stood a breaking strain of 85 pounds, when a similar line of coir broke at 75 pounds and that a ship's anchor in the Hooghly was raised by a cable of this fibre when three Russian cables had broken in the attempt to raise it. The fibre is light and floats on water and is as elastic as that of coir. The chief objection to its general use seems to be its black colour, but in these days when good fibres of all kinds are in request so useful a fibre would not be likely to be rejected as useless from its colour.

The thicker fibres are well adapted for brushes, and would perhaps take the place of Kitul and Piassava to a large extent, and probably would be cheaper than either. Rope and other articles made of this fibre are always exhibited at the local agricultural shows, and it is really the best known fibre in the Peninsula. There seems therefore no reason why it should not come into use in Europe.

Curculigo Fibre.—The common jungle plants *Curculigo recurvata* and *C. latifolia* and *villosa* known to the Malays as Lumbah, produce from their leaves a strong fibre used by the Dyaks for cloth and fishing nets. The plant is generally to be found in shady places, and is known by its tufts of large flaccid lanceolate leaves, plicate and dark green, usually more or less pubescent beneath. The flowers are yellow, borne in a tuft at the base of the leaves, sessile in *C. latifolia* and *villosa* and borne on a longer or shorter peduncle in *C. recurvata*. The latter species is the biggest and its leaves are four feet and a half long (exclusive of the stalk which may be two feet long), and eight inches across the middle. The leaves steeped in water took fourteen days to soak before the soft parts of the leaves could be washed away, after which it could easily be rubbed off by hand. The leaves seem too flaccid to work by machinery. Lumbah fibre has never come into the market so far as I know. It is, in fact, rather troublesome to make, as owing to the flaccidity of its leaves it cannot be worked by any of the ordinary machines, and is always extracted by hand. The leaves are first soaked in water and then beaten to get rid of the cellular substance between the fibres.

I planted some years ago a bed of *C. recurvata*, in full sun in good soil in order to see whether the plant would grow and give good returns under that treatment, but the plant did not seem to like full exposure to the sun. It grew steadily, but the leaves were short, and not very abundant. Should a reasonable price be obtained for this fibre, it might be worth while getting it collected by natives, and also planting it in dense shade, or perhaps better along the jungle edges, where it seems to grow very fine and strong. It requires no care under these circumstances and can look after itself very well.

Experiments are being made with it at the Botanic Gardens, both in retting the leaves in water and also by splitting the leaves up and drying it so as to form perhaps a substitute for Raphia bast for which the demand at present is much in excess of the supply.

Bishop HOSE, who knows the plant well in Sarawak, tells me that the Dyaks there use the fibre in a very curious way. It is water-proof, and the cloth-weavers twist the Lumbah fibre round the threads of the cloth they do not wish to be dyed by any given colour, and after the cloth has been dipped in, say, red dye, they take it out and remove the Lumbah fibre so that the hitherto uncoloured threads may be dyed in blue or other colour, by dipping the cloth again in the latter dye.

Other tribes weave the fibre into cloth. I am not certain which species the Dyaks use in this way, but it is probably *C. recurvata*.

TILE POTS FOR CASUARINA SEEDLINGS.

In Mr. HUDSON's article on Casuarina cultivation he describes the tile pots he used, and now writes a suggestion which may be useful for not only these seedlings but those of many other plants. He applied to a Chinese towkay brickmaker to make the tiles as described and the Chinaman suggested, "Why not buy cheap tin rainwater piping of the required circumference, 6 inches, and get any tinsmith to cut the pipes across to any length required for a pot (12 inches) and then split them into equal halves, or tin guttering may be used if obtainable." Being in the nursery daily watering must be done and having the lower end open and resting on potsheds the imperviousness of the sidewalls of tin will not affect the plant by want of evaporation and causing water logging.

As explained in the previous paper the tilepots are buried in beds so that the question of the sun's rays scorching the roots, tin being a ready conductor of heat, does not come in. The idea appealed to me immensely as it reduces the cost in breakage, compared with tiles and tin piping is cheap especially if bought in quantity.

The idea certainly seems a good one, and would certainly be cheaper in the long run than tiles.

Speaking of the germination of Casuarina seed, Mr. HUDSON writes, "I put in Casuarina seed on the 12th of this month and behold, in 5 days they had sprouted."—*Editor.*

RUBBER PESTS.

A planter sends a number of leaves of seedling rubbers badly attacked with the fungus described in Bulletin III, 8 p. 308. It has attacked a whole nursery of seedlings, and has pretty nearly destroyed the plants. I find also this year a number of plants I had planted out too early badly infested. In cases of nursery infection it seems desirable as soon as the disease is seen, to remove all infected plants and especially fallen leaves. If only one or two leaves on a plant are attacked these could be pulled off and burnt, (Para rubber stands the loss of its leaves very well), and then disinfecting with Bordeaux mixture, the plants and nursery beds should get rid of the pest. Plants in too damp a spot, or sickly ones which have been injured seem to suffer most. All I can see in the spot where my seedlings are worst attacked are small plants not more than 6-12 inches tall. Bigger plants have fine clean leaves, but these may have survived an attack when young or not been attacked at all and so made good growth.

Mr. LITTLE, who has a rubber plantation in Singapore, brought a large number of that abominable animal, the Coffee locust, *Cyrtanthacris varia*, which had apparently been chewing the tips of his Para rubber leaves much to their detriment. This large yellow and green locust with its bright pink hind wings has been described in Bulletin.

It does not seem very particular as to what it eats, any leaves soft enough will do for it, and it soon makes rags of Canna and Dracæna leaves. Fortunately it is easy to catch ; children can catch them by hand or knock them down with sticks. The young locusts usually live in grass and scrub and if these animals appear on the estate any of this should be cut down in the neighbourhood. Quite a small patch of long grass and weeds will form a home for a number of these locusts.

Some seedlings I planted out experimentally quite young in a grassy wet spot suffered from a complexity of pests. Beside the fungus alluded to I found in the evening some small brown slugs about an inch long very slimy and active which nibbled off the shoots, and one of the common bag-worms, a caterpillar living in a grey silk conical case, was attacking the leaves; small grasshoppers too were attacking the leaves. Many leaf-eating insects, when their special food runs short, will attack any plant that happens to be near, and do more or less harm. It is, therefore, not advisable to plant out seedlings in uncleared ground too young. Stumps or plants about 6 feet tall seem to escape all these kinds of vermin, the leaves being too high for them to find.—*Editor.*

PRICE OF RUBBER STILL RISING.

A note in the *Ceylon Weekly Times* records a rise in price of rubber in Ceylon from general estates to 6/4½, fine Para at the time fetching 5/4½. Similar prices have been obtained in the Malay Peninsula and we hear of one estate which has beaten the Ceylon records at 6/6. High prices are expected to continue for some time. Meanwhile a good many estates in the Peninsula are profiting by the demand and, we understand, are making a good haul, which will go a long way to counteract losses in bygone years on Coffee and the like.

THE PRICE OF RUBBER.

A RISE.

The notification issued on December 4th by India-rubber manufacturers of another 10 per cent rise in mechanical goods has doubtless come as unwelcome intelligence to those primarily affected by it. Yet there will be few, says the *Engineer,* who will dispute its justification in the light of the continued rise in price of the raw material. Para rubber has recently touched figures hitherto without parallel, and the ingenuity of the manufacturers has been taxed to the utmost to cope with the altered situation. The difficulties that have been met with are reflected in the report of the big Silvertown Company, which, with an increase of sales, shows a considerable falling off in profits. Buyers of rubber goods may feel assured that the recent advance in price was determined upon as a matter of stern necessity, and is in no way the outcome of any desire on the part of the manufacturers to take advantage of the altered situation in order to enhance their profits.

It is understood that the members of the Rubber Manufacturers' Association were unanimous with regard to the rise, and that only two of the firms who are not actually members of the Association have declined to fall into line with the majority. Standing aloof in a case of this sort implies the possession of a large stock of raw rubber bought at lower prices than now prevail, or else it indicates a desire to take advantage of the situation in order to make an increased connection without taking much thought as to the profit and loss account. Of course, this is a matter entirely for individual firms concerned: and if they think they know their own business best, others have no legitimate ground for cavilling.

Cotton enters largely into mechanical rubber goods such as hose, beltings, packings, etc.; and at the time of the last advance in prices this material was put forward with rubber as a partial cause of the advance; at the present time, however, rubber alone will have to bear the brunt, as the revival in the Lancashire cotton trade presages considerably easier prices for the textile materials so largely used in the mechanical rubber trade.

No doubt, in spite of our contention that the rise of price in rubber goods is amply justified, there will be many who will grumble at it. To these we would put the straight question. What is the alternative? Seeing that the trade is not carried on from Benthamite motives, and that, therefore, working at a loss is out of the question, a continuance of old prices means the reduction of quality. There is nothing else for it. Now, this way of getting out of the difficulty has been tried often enough in the past, and has to a large extent brought discredit upon a reputable industry. We believe it is now being generally recognised by engineers that good rubber is the cheapest in the long run, and since the more general employment of chemical analysis by purchasers, it has become less common for the cheap compounds of the unscrupulous manufacturer to find a sale than it was, say, ten years ago. We are not, of course, suggesting that goods should be made of pure rubber, nor are we condemning the use of mineral matters erroneously described by some writers as adulterants. For many purposes a pure rubber without mineral admixture would be not only a waste of money but actually disadvantageous. Our criticism is directed against those who, instead of using new, sound rubber, in however small a proportion, replace it by old or "recovered" rubber or oil substitutes. These bodies are not to be generally condemned, for they have their legitimate uses. We are not, however, considering these now, our point being to emphasise that they can not take the place of new, sound rubber without considerably lowering the value of the goods. With the present rise in price, therefore, purchasers although they may naturally indulge in a little grumbling, may feel assured that the quality of the goods they buy will remain equal to what it has been in the past, which would be practically impossible if prices remained at the old level.

The Reason Why.

With regard to the cause of the rise in raw rubber, there is no good reason to suppose that it is assignable to anything but the ordinary law of demand and supply. It has certainly been broadly hinted that rubber brokers, and one large house in particular, have manipulated the market for their personal advantage; but really statements to this effect do not show any substantial foundation. Of course, the brokers are alive to the situation, and have not gone out of their way to make crooked paths straight for the manufacturer. This, however, is not the same thing as saying that rubber has practically been cornered. We prefer to believe that the increased demand for motor tyres, heel pads, and other uses which come prominently before the eye, as also the demand for rubber in modern shipbuilding which is little known to the public, are jointly the reason for the advance. Unfortunately, although there is no scarcity of rubber in South America, its production, though on an increasing scale, has not kept pace with the growing demand from Great Britain, America, Germany, France, Russia and Italy, to say nothing of other countries, such as Norway and Sweden, which have of late years become manufacturers. The difficulty with regard to increasing the output from the Amazon basin is the comparative scarcity of acclimatised labour, and that the regular rubber gatherers are often seduced from their occupation by the offer of better terms on the coffee plantations. There are probably few vocations of a more deadly nature than that of rubber gathering in the Brazilian swamps, and even in the case of the acclimatised, *seringueros*, the merchants who provide the outfit and expenses of the bands of gatherers have to count on a high death-rate, and consequent loss of capital. So far no attempt to copy the slave-driving methods followed by the Congo State authorities has been made, greatly to the credit of all concerned. Rubber may have become a necessity, but is not so indispensable that the civilised nations who use it can regard with unconcern the employment of methods of barbarism in its collection. More than one effort has been made in the past by Europeans to control the working of Amazonian forests, but the failures which have resulted, from causes which we cannot stop to specify, has led to a general recognition of the fact that the resources of Brazil are best left in the hands of Brazilians. With regard to other countries in South America there is no doubt that Peru will contribute more largely than is at present the case if certain developments necessitating capital come to fruition. From Africa the supply has fluctuated a good deal, the phenomenal rise in the exports from the Belgian trading companies being to some extent counterbalanced by the decreased amounts yielded by some of the West Coast districts, owing to the destructive methods of collection formerly practised by the natives. With respect to the supply of rubber from plantations, although the amount has thus far not had any appreciable effect on the market, great progress in what is a new and important branch of economic botany has to be recorded. Especially is this the case with the Para rubber tree, which has been successfully acclimatised in Ceylon and the Straits Settlements, and which, no doubt, will find its way into West Africa. It is not so many years ago that the results already obtained were held to be impossible of achievement, but the cries of the pessimists have been falsified in the event.

COMPARISON OF VALUES.

There are yet one or two technical points as to the comparative value of the rubber produced in Brazil and Ceylon to be settled, but, in this general survey we did not stop to inquire into them. Suffice it to say that fine Para rubber is now being grown in Ceylon, and finds a ready market at prices quite equal to what is ruling for the forest product. Although such forestry operations are of necessity slow in their growth, and the capital expenditure unremunerative for a number of years, it may be taken that plantation rubber is now an accomplished fact, and that from this source in many parts of the world the supply of natural rubber will be augmented to an increasing extent in the future. The rubber manufacturers say that in order to ensure them busy and progressive times, Para rubber should be in the neighbourhood of 3*s.* per lb.; quite recently it has touched 5*s.* 5*d.*, and it must be confessed that the price which would be welcomed by manufacturers and customers alike seems, at the present time, very remote, and the user of rubber goods must perforce accept the situation with what degree of equanimity he can command. Perhaps the chief element which tends to threaten his quiescence of mind is a suspicion that, although rubber manufacturers are apt to act promptly in raising prices when necessity compels, they exhibit a somewhat sluggish movement with regard to a reduction when the price of the raw material falls. Now, with respect to the prices of the various qualities of rubber on the market, the ordinary man cannot be expected to be informed, but as all other rubbers follow the price of Para more or less closely and as Para is quoted in the market reports of most of the daily papers, there is nothing to prevent the engineer who is a buyer of rubber goods from forming his own opinion, to some extent at least, as to when the time has arrived for the removal of the import. Of course, he can keep on at old prices now if he wants to, but, as we have already indicated, we think this would be a wrong policy, as he would assuredly get an inferior article, although the reduction might not be apparent to the senses.

(Extract from the "Straits Times" of the 17th February, 1905.)

PARA BEATEN BY CEYLON.

Victoire acquise aux anglais! Thus commences an article by Mr. CIBOT in the Journal d' Agriculture Tropicale. Mr. PAUL CIBOT who has travelled to Venezuela to study Para rubber has also been lately in the Malay Peninsula where he expressed his surprise at the marvellous growth of the trees of Para rubber which he had seen in Singapore, Province Wellesley and the Malay States. In the paper above cited he writes, "In No. 23 of the Journal d' Agriculture Tropicale, I remarked the more or less nearly approaching exhaustion of the rubber forests of the Amazons.

In twenty years, ten perhaps, the forests having been all discovered and exploited, one must foresee a diminution in the return of this region which can only keep up its amount of export by means of the discovery of new virgin forests and then there will commence an era of grand profit for the plantations that are now being made."

Now there is another factor which it seems must threaten the Amazon's product, with a much nearer falling off. It is the very low cost of export of the Asiatic rubber.

In 1903 Ceylon exported 30,000 Kilograms of rubber which fetched a distinctly higher price than fine smoked Para. One might believe that this price is only exceptional and due to the manufacturers being anxious to try this new class of rubber, having given a favourable price for it. Doubtless this is so to a certain extent but when one considers that this rubber dried before export loses very little weight in the store that it is produced in the form of thin translucent biscuits showing the purity of the product which requires a much shorter manipulation. If we consider all these real advantages, we see that the increased value of the rubber of cultivated Hevea is quite justified. But the important point is that the cost of the shipping of Ceylon rubber to Liverpool is not more than 2 francs the Kilo., whilst that from Amazonas even if it was exported by the producer in the same condition would cost at least 5 francs a Kilo. The difference between these two costs is so great that it leaves a margin almost sufficient for any errors of over valuation in the calculations for the Ceylon rubber.

We can thus foresee the day when the plantations in Asia will put on the market thousands of tons of a rubber prepared in the most careful manner at a much lower price than that of Amazonas even if the Brazilian Government lowers considerably the export duty on rubber. This, however, is one of its principle sources of revenue. This time is not yet very near as the uses of rubber are being continually increased, and the Asiatic plantations are not big enough yet to produce many thousand tons of rubber. The area planted with rubber, chiefly *Hevea*, in Ceylon is estimated at more than 4,000 hectares (10,000 acres) planted exclusively with rubber trees and 10,600 hectares on which rubber trees are used as shade trees or along edges of roads, ditches, etc., in tea and cocoa plantations.

If we admit in the first case there are an average of 500 trees to the hectare and in the second 125 to the hectare we shall get a total of 3,350,000 rubber trees. If we allow according to English writers that twice as much is planted in the Malay Peninsula and neighbouring islands we shall have 6,700,000 rubber trees, altogether ten million trees planted up to date.

It is right to add that the plantations in Malaysia are partly of *Ficus elastica*, the rubber of which will not command as high a price as that of the *Hevea*. All these plantations having been only made within the last two or three years, it will be not before five years that Asia can put enough rubber on the market, say 5,000 tons to influence it.

Till then and for some years after the Asiatic producers will benefit by the very high prices which will allow them to recover their capital to a large extent, to increase their plantations and to perfect the manufacture whilst Amazonas which cannot employ the same methods will see the era of prosperity for the last 20 years disappear or at least decrease. Reading the Brazilian journals it does not appear that in that country, chiefly interested in rubber, any one has a notion of the great danger which Brazil and the other countries of the basin of the Amazon only escape by a general improvement of their economic civilization and by doing what the English are doing, that is to say, organizing plantations of *Hevea*, in most suitable localities instead of merely exploiting the natural forests situated thousands of miles away in the interior.

P. CIBOT,
(*Transl.*)

THE CANKER OF PARA RUBBER.

In one of the circulars of the Botanic Gardens of Ceylon, Mr. CARRUTHERS gives an account of the canker in the trees in Ceylon. The fungus causing the disease is a species of *Nectria*. In its attack it does not appear to be very clearly conspicuous from the outside. The external colour of the bark is in many cases different from that of the healthy parts, as a rule a little darker, and the bark surface is different in appearance. As the bark dies it is attacked by boring insects which tunnel into even living parts and cause an exudation of latex. This is not however a certain sign of the presence of canker as it happens in any case of death of wood or bark from whatever cause. The tissue below the bark, however, is very differently colored, of a dirty yellow or neutral tint and when the fungus has got complete hold it is claret colored like the skin of a mangosteen. Wherever the canker occurs, latex disappears. The stem and branches are equally liable to attack, but the roots and twigs are unaffected.

The life history of the fungus is like that of all fungi of the kind. The mycelian permeates the cells for some time destroying them, and at a certain time produces spores of two kinds, the first gouidiospores are whitish grey in mass and look like thick white mould, Later at the same spot are produced the perfect fruits which resemble grains of red pepper, sometimes forming a mass as big as a ten cent piece. These produce spores which are readily disposed by wind or perhaps carried about by insects. When the spores find a suitable spot they push out the mycelium tubes into the bark and so the disease commences.

Occasionally trees cure themselves, but this must not be relied on. The fungus dies and the growth of the tissues round the cankered spot serves to drive out the dead piece. A considerable proportion of the fruits of the Para rubber tree having been found to have fallen unripe, they were examined and were found in some cases at least to be infected with the canker, but whether they were attacked while on the tree or after falling seems doubtful. In any case fallen black fruits should be destroyed when found.

To cure the tree it is necessary to cut out all the diseased part of the bark down to the wood, if the disease has spread as far. A margin of not less than 2 inches should be cut round the discolored area so as to be sure of getting out all the mycelium. Dying branches high up in the tree should be suspected and cut well back; and all dead or diseased pieces destroyed by fire as near as possible as it is dangerous to carry them about the plantation, for fear that any spores on them might be drifted into the trees as they are borne along.

This is only a short précis of the paper which is a very important one for planters of rubber. The disease is one which as yet is not common at least in the Malay Peninsula, although it has been reported thence; therefore care should be taken that it does not invade the country, or if it does appear that it should be rigorously looked for and destroyed when found. As it is certainly more frequent in Ceylon than in the Peninsula, great care should be exercised in introducing fresh stock of rubber plants and seeds from that country. Seeds in themselves are doubtless quite safe, but fragments of the husks picked up on the ground and such like material sent in packing might possibly introduce the plant. Seedlings again are probably safe, but stumps of a greater age might be infected. Estates should be regularly and carefully inspected, tree by tree, by the planter to see that neither this nor any other disease is threatening, and steps taken at once to check any that may be found. An insanitary estate is a danger to its neighbours and it is almost invariably the case that the bad outbreaks of disease in plantations have been due to carelessness and ignorance of one or two owners.—*Editor.*

HEVEAS IN THE AMAZON.

In the Beihefte zum Tropenpflanzer, Vol. VI 1, p. 1, just published, is the account of an expedition by HERR ULE to the Rubber region of the Amazons to investigate the collecting and preparation of Rubber there. He mentions and partly describes 13 species or forms of Heveas and gives a figure of *H. braziliensis* and *H. discolor*, but the descriptions of most of his new species are quite insufficient to identify them by. He gives also an account of the methods of collecting and preparation of the rubber by the Seringueiros, and illustrative photographs. The system used by these people is well enough known and need not be repeated. He confirms however again the statement that the *Hevea braziliensis*, grows on the flooded banks of the Amazon. The driest months are July, August and September. The rains commence in October lasting with short breaks till February or March. The river commences to rise in October and is highest in June, when in many places it is 10 to 20 inches above its ordinary level and it is in these flooded woods that *Hevea braziliensis* grows mixed with many other large trees including *Couroupita, Lecythis, Bombax*, *Cedrela*, *Hura crepitans* and chocolate.

Of the other kinds of Hevea he mentions *H. Spruceana*, and a kind called *Itauba* which give a second quality of latex. *H. nigra*, *H. paludosa*, *H. orelha da onca*, *H. microphylla*, Sarapo and *H. pauciflora* are hardly valued at all by the rubber collectors, or the latex is only used to mix with and adulterate that of *H. braziliensis*. The latex also of *Sapium Taburu*, is used to mix with Para rubber.

Micrandra siphonoides is another rubber plant from this district. A picture of its leaves, flowers, and fruits is given, and it is stated that the rubber from it resembles in structure, colour, and elasticity the Rambong rubber of Java and Sumatra and is valued at 7·50 marks per kilogramme, with Para rubber at 9·00 marks It grows with other rubber trees on the Rio Negro, and might perhaps be worth some attention, but it has not so far as I know, been brought into cultivation as yet.

A map of the Amazons region showing the distribution of the Para rubber along the main branches of the Amazons is given, which seems to show that it is exclusively confined to the river banks.

RUBBER SEEDS FOR OIL AND OIL CAKE.

IMPERIAL INSTITUTE OF THE
UNITED KINGDOM, THE COLONIES AND INDIA,
IMPERIAL INSTITUTE ROAD, LONDON, S. W.

20th January, 1905.

SIR,—I have the honour to inform you that since the publication in the "Bulletin of the Imperial Institute," (Vol. I., 1903, p. 156) of the report on the utilisation of the seeds of the Para rubber tree, forwarded to you through the Colonial Office on the 21st November, 1903, a considerable number of enquiries have been received here relative to the possibility of obtaining commercial supplies of the seed or oil. So far some difficulty has been experienced in obtaining these supplies, but now I understand a quantity of Ceylon seed is being placed on this market, though none has been sent from the Straits Settlements.

Since there appears to be a fair prospect of this seed being largely imported into this country for the expression of oil it becomes important that the suitability of the residual cake for feeding cattle should be determined, and that the oil should be further experimented with.

For these purposes it will be necessary to have a supply of about three hundredweights of the seed, or better, if procurable, the oil (about 5 gallons) and the residual cake (2 or 3 cwt.) left after the oil has been expressed.

I hope that it will be possible to comply with this request at an early date in order that the further information which is necessary to the development of trade in this product may be obtained without delay.

The sample of Para rubber seed meal originally received at the Imperial Institute in May, 1903, was sent by the Superintendent of Gardens and Forests, Penang. Perhaps this officer may be able to collect the further supply of seeds now asked for?

I have, etc.,

WYNDHAM R. DUNSTAN.

To His Excellency the Governor, Singapore,
Straits Settlements.

PERSONAL AND OTHER NOTES.

Mr. P. J. BURGESS left for England on March 2nd, 1905, on a visit of six months to inspect rubber manufactories and confer with manufacturers of rubber. He took with him a quantity of liquid latex preserved with Formaline for experiment and some remarkably fine photographs of rubber, trees, and methods of tapping, etc.

The old and well known Tropical Agriculturist has undergone a change of hands. It is now amalgamated with the Magazine of the Ceylon Agricultural Society and will in future be published under the editorship of Dr. WILLIS. The Ceylon Agricultural Society was founded last October, and is well supported by the Ceylon Government, His Excellency the Governor being President and the Members of the Legislative Council and Government Agents together with the Government Officials being on the Committee.

We must congratulate the Ceylon planters on the interest taken in Agriculture there by the Government, too often lacking in English Colonies, and also for the first time we believe in having a regularly published journal emanating from the Botanic Gardens.

The first number of the new publication is illustrated by a number of good photogravures.—*Editor.*

TERMITES AND RUBBER.

LANADRON ESTATE,
Muar, viâ Singapore,
Straits Settlements.
16th February, 1905.

The Editor,
THE AGRICULTURAL BULLETIN,
Singapore.

Dear Sir,—*Re* Termes Gestroi attacking Para Rubber when growing in grass (cf. your note to Mr. ROBINSON'S paper on Termites in your December issue) :—

I have found numerous cases of this occurring and not only when the trees are surrounded by grass, but also when growing in lalang. Neither of these seem to be any hindrance to them, as they carry on their labours as vigorously as ever destroying several adjacent trees as they would do were the ground clear.

Your faithfully,
ROGER PEARS.

TAPPING FICUS ELASTICA.

LANADRON ESTATE,
Muar, viâ Singapore,
Straits Settlements.
15th February, 1905.

The Editor,
THE AGRICULTURAL BULLETIN,
Singapore.

Sir,—The following method of tapping Rambong (Ficus Elastica) may be of interest to some of your readers :—

A V-shaped channel is first cut in the outer bark only with an ordinary gouge, and at the foot of this the tin is fixed; a single deep cut penetrating to the wood is then made down the centre of each arm of the V channel, when the latex flows freely out. For making this latter cut an ordinary dinner knife does as well as anything as the blade is straight and thin.

Using this method 8 coolies working half a day only on $4\frac{1}{2}$ year old trees have collected sufficient latex to make $11\frac{1}{2}$ lbs. of wet biscuit which should weigh when dry about 8 lbs. Coagulation was brought about by boiling as recommended by Mr. LARKEN.

One day's tapping of course exhausts a tree for the time being, and it remains to be proved by experience what interval of time must elapse before a full yield can again be obtained, but from observations taken I should put this at not less than three months.

The "scrap" can be collected from the cuts if desired, but since these offer rather too good a place for the lodgment of water it seems almost wiser to leave the tree this natural protection; perhaps too the presence of this "scrap" may prevent the throwing out of aerial roots.

Your faithfully,
ROGER PEARS.

RUBBER SEED WANTED.

Mr. F. KNOCKER, Museum, Taiping, Perak, forwards the following letter asking for Para rubber seed. Any planter who can supply what is wanted might correspond with him, or with the firm requiring seed:—

The Curator,

Perak Museum, Perak.

Dear Sir,—We are likely to require a quantity of Para Rubber Seed, if position is favourable, and we shall be much obliged if you can put us in communication with Planters or Merchants who could supply us with this article.

Yours truly,
CLEMONS, MARSHALL & CARBERT,
Leeds.

MISCELLANEOUS.

NOTICES TO SUBSCRIBERS.

1. For the information of subscribers and others who wish to complete their series of Bulletins, notice is given that numbers 1, 7, 8 and 9, of the old Series (1891 to 1900) and Nos. 1, 8, 9 and 10, of New Series, Vol. I (1901-1902) have been reprinted and copies can be had by all whose subscriptions are paid up to date. The cost to others is 50 cents a number.

2. A very large number of subscriptions, even for last year, are yet unpaid although subscribers have received more than one notice of the delay in payment. As this entails a good deal of extra work

on the staff, subscribers are asked to send in their subscriptions without delay. Attention is called to the rule that all subscriptions should be prepaid.

3. Subscribers changing their addresses are requested to give notice to the Editor.

4. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 to cover postage.

Meteorological observers are asked to send in their returns to arrive before the 10th day of the following month, if possible, so as to be in time for going to press.

Rainfall for March, 1905 :—

The Prison ...	Ins.	3·57
The Fort ...	,,	2·11
The Government Hill ...	,,	3·98
Balik Pulau ...	,,	3·34
Pulau Jerejak ...	,,	3·65
Lumut	,,	3·06
Pangkor	,,	3·25
Bruas	,,	5·84

M. E. SCRIVEN,
Assistant Surgeon,
Prison Observatory.

Penang, April, 1905.

Highest and Lowest Temperatures on the Hill and the Plains for the first quarter of the year 1905.

	January.		February.		March.		Remarks.
	Highest Temperature.	Lowest Temperature.	Highest Temperature.	Lowest Temperature.	Highest Temperature.	Lowest Temperature.	
The Government Hill ...	79·0	62·0	80·0	63·0	83·0	64·0	
The Prison Observatory	91·0	70·0	93·0	67·0	94·0	69·0	

M. E. SCRIVEN.

SINGAPORE MARKET REPORT.

March, 1905.

Articles.	Quantity sold.	Highest price.	Lowest price.	
	Tons.	$	$	
Coffee—Palembang	15	34.00	31.00	
Bali	40	25.50	24.00	
Liberian	172	24.00	22.00	
Copra	4,390	8.70	7.80	
Gambier	2,414	9.00	8.75	
Cube Gambier, Nos. 1 and 2	334	13.50	12.00	
Gutta Percha, 1st quality	...	200.00	150.00	
Medium	...	100.00	90.00	
Lower	...	80.00	19.00	
Borneo Rubber 1, 2, and 3	...	150.00	95.00	
Gutta Jelutong	...	8.50	7.00	
Nutmegs, No. 110's	...	38.00	37.00	
No. 80's	...	59.00	59.00	
Mace, Banda	...	85.00	85.00	
Amboyna	...	68.00	68.00	
Pepper, Black	736	26.50	25.25	
White (Sarawak)	359	39.50	37.25	
Pearl Sago, Small	30	4.70	4.60	
Medium	...	4.50		
Large	...	5.50		
Sago Flour, No. 1	3,405	3.25	3.05	
No. 2	515	1.12½	1.00	
Flake Tapioca, Small	247	4.40	4.35	Closing fair.
Medium	25	4.50		
Pearl Tapioca, Small	357	4.40	4.35	
Medium	291	4.20	4.15	
Bullet	65	5.75	5.15	
Tin	2,120	80.37½	76.62½	

Export Telegram to Europe and America.

For Fortnight ending 15th March, 1905.

Wired at 6 p.m. on 16th March, 1905.

					Tons.
Tin	Str.	Singapore & Penang to	United Kingdom &/or		925
Do.	,,	Do.	U. S. A.		1,056
Do.	,,	Do.	Continent		378
Gambier	,,	Singapore	Glasgow		...
Do.	,,	Do.	London		...
Do.	,,	Do.	Liverpool		100
Do.	,,	Do.	U. K. &/or Continent		175
Cube Gambier	,,	Do.	United Kingdom		20
Black Pepper	,,	Do.	Do.		...
Do.	,,	Penang	Do.		20
White Pepper	,,	Singapore	Do.		110
Do.	,,	Penang	Do.		...
Pearl Sago	,,	Singapore	Do.		85
Sago flour	,,	Do.	London		210
Do.	,,	Do.	Liverpool		2,170
Do.	,,	Do.	Glasgow		200
Tapioca Flake	,,	Singapore & Penang	United Kingdom		180
T. Pearl & Bullets	,,	Do.	Do.		430
Tapioca Flour	,,	Penang	Do.		158
Gutta Percha	,,	Singapore	Do.		25
Buffalo Hides	,,	Do.	Do.		85
Pineapples	,,	Do.	Do.	cases	17,000
Gambier	,,	Do.	U. S. A.		175
Cube Gambier	,,	Do.	Do.		40
Black Pepper	,,	Do.	Do.		275
Do.	,,	Penang	Do.		220
White Pepper	,,	Singapore	Do.		10
Do.	,,	Penang	Do.		...
T. Flake & Pearl	,,	Singapore & Penang	Do.		300
Nutmegs	,,	Do.	Do.		12
Sago Flour	,,	Singapore	Do.		125
Pineapples	,,	Do.	Do.	cases	4,750
Do.	,,	Do.	Continent	,,	3,250
Gambier	,,	Do.	S. Continent		120
Do.	,,	Do.	N. Continent		175
Cube Gambier	,,	Do.	Continent		5
Black Pepper	,,	Do.	S. Continent		440
Do.	,,	Do.	N. Continent		110
Do.	,,	Penang	S. Continent		40
Do.	,,	Do.	N. Continent		...
White Pepper	,,	Singapore	S. Continent		30
Do.	,,	Do.	N. Continent		80
Do.	,,	Penang	S. Continent		...
Do.	,,	Do.	N. Continent		10
Copra	,,	Singapore & Penang	Marseilles		660
Do.	,,	Do.	Odessa		1,500
Do.	,,	Do.	Other S. Continent		1,175
Do.	,,	Do.	N. Continent		500
Sago Flour	,,	Do.	Continent		900
Tapioca Flake	,,	Singapore & Penang	Do.		110
Do. Pearl	,,	Do.	Do.		180
Copra	,,	Singapore	England		...

				Tons.
Gambier	Str.	Singapore	U. S. A.	...
Cube Gambier	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	...
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	...
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	...
Pineapples	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...

1,500 tons Gambier }
370 ,, Black Pepper } Contracts.

Export Telegram to Europe and America.

For Fortnight ending 31st March, 1905.

Wired at 5.30 p.m. on 3rd April, 1905.

				Tons.
Tin	Str.	Singapore and Penang to	United Kingdom &/or	1050
Do.	,,	Do.	U. S. A.	600
Do.	,,	Do.	Continent	160
Gambier	,,	Singapore	Glasgow	...
Do.	,,	Do.	London	..
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	U. K. &/or Continent	150
Cube Gambier	,,	Do.	United Kingdom	30
Black Pepper	,,	Do.	Do.	110
Do.	,,	Penang	Do.	130
White Pepper	,,	Singapore.	Do.	10
Do.	,,	Penang	Do.	...
Pearl Sago	,,	Singapore	Do.	10
Sago flour	,,	Do.	London	50
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	Glasgow	50
Tapioca Flake	,,	Singapore & Penang	United Kingdom	110
T. Pearl & Bullets	,,	Do.	Do.	100
Tapioca Flour	,,	Penang	Do.	270
Gutta Percha	,,	Singapore	Do.	65
Buffalo Hides	,,	Do.	Do.	70
Pineapples	,,	Do.	Do.	Cases 9,000
Gambier	,,	Do.	U. S. A.	775
Cube Gambier	,,	Do.	Do.	55
Black Pepper	,,	Do.	Do.	130
Do.	,,	Penang	Do.	100
White Pepper	,,	Singapore	Do.	45
Do.	,,	Penang	Do.	...
T. Flake & Pearl	,,	Singapore & Penang	Do.	320
Nutmegs	,,	Do.	Do.	31
Sago Flour	,,	Singapore	Do.	40

					Tons.
Pineapples	Str.	Singapore	U. S. A.	Cases	3,750
Do.	,,	Do.	Continent	,,	1,500
Gambier	,,	Do.	S. Continent		25
Do.	,,	Do.	N. Continent		25
Cube Gambier	,,	Do.	Continent		30
Black Pepper	,,	Do.	S. Continent		10
Do.	,,	Do.	N. Continent		65
Do.	,,	Penang	S. Continent		...
Do.	,,	Do.	N. Continent		...
White Pepper	,,	Singapore	S. Continent		...
Do.	,,	Do.	N. Continent		40
Do.	,,	Penang	S. Continent		...
Do.	,,	Do.	N. Continent		...
Copra	,,	Singapore & Penang	Marseilles		200
Do.	,,	Do.	Odessa		150
Do.	,,	Do.	Other South Continent		...
Do.	,,	Do.	N. Continent		200
Sago Flour	,,	Do.	Continent		325
Tapioca Flake	,,	Singapore & Peneng	Do.		180
Do. Pearl	,,	Do.	Do.		170
Copra	,,	Singapore	England		...
Gambier	,,	Do.	U. S. A.		...
Cube Gambier	,,	Do.	Do.		...
T. Flake and Pearl	,,	Do.	Do.		...
Sago Flour	,,	Do.	Do.		...
Gambier	,,	Do.	S. Continent		...
Copra	,,	Do.	Marseilles		...
Black Pepper	,,	Do.	S. Continent		...
White Pepper	,,	Do.	Do.		...
Do.	,,	Do.	U. S. A.		...
Pineapples	,,	Do.	Do.		...
Nutmegs	,,	Do.	Do.		...
Black Pepper	,,	Do.	Do.		...
Do.	,,	Penang	Do.		...
White Pepper	,	Do.	Do.		...
T. Flake & Pearl	,	Do.	Do.		...
Nutmegs	,,	Do.	Do.		...

1,100 tons Gambier } Contracts
525 ,, Black Pepper }

Singapore.

Abstract of Meteorological Readings for the month of February, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29,919	139·1	78·6	88·1	72·3	15·8	76·2	844·	74·5	80	N.E.	10·35	3·95
Botanic Gardens	...	...	...	...	...	...	...	...	...	...		6·90	2·45

A. B. LEICESTER,
Meterological Observer.

D. K. McDOWELL,
Principal Civil Medical Officer, S. S.

Candang Kerbau Hospital Observatory.

Singapore, 20th March, 1905.

Singapore.

Abstract of Meteorological Readings for the month of March, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·920	148·3	81·6	91·2	73·7	17·5	77·4	·845	74·6	74	E.N.E.	3·35	1·44
Botanic Gardens	...	...	...	...	...	...	...	...	...	...	...		

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL,
Principal Civil Medical Officer, S.S.

Kandang Kerbau Hospital Observatory,
Singapore, 13th April, 1905.

Penang.

Abstract of Meteorological Readings in the Prison Observatory for March, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Criminal Prison Observatory	29·912	155·5	81·8	92·0	74·1	17·9	75·9	·795	70·88	70	N. W.	3·57	1·19

Colonial Surgeon's Office,
Penang, 10th April, 1905.

M. E. SCRIVEN,
Assistant Surgeon.

T. C. MUGLISTON,
Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for the month of February, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Durian Daun Hospital	29·828	156·1	82·4	88·6	74·8	13·8	79·6	·994	71·4	89	E.	2·00	1·19

Colonial Surgeon's Office,
Malacca, 22nd March, 1905.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Malacca.

Abstract of Meteorological Readings for the month of March, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Durian Daun Hospital ...	29·812	145·3	82·4	87·9	74·7	13·2	76·4	·829	70·7	76	E.	4·72	1·50

F. B. CROUCHER,

Colonial Surgeon, Malacca.

Colonial Surgeon's Office,

Malacca, 10th April, 1905.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of March, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping ...	...	153	82·53	94	70	23	77·60	877	...	78	...	20·44	2·85
Kuala Kangsar ...	...	...	81·47	95	68	26	75·88	829	...	77	...	4·15	1·31
Batu Gajah ...	...	160	81·92	95	70	25	76·84	857	...	79	...	10·09	2·23
Gopeng ...	...	...	81·06	95	63	30	75·71	820	...	78	...	5·09	1·03
Ipoh ...	...	...	80·85	94	70	23	77·77	901	...	87	...	4·88	1·23
Kampar ...	...	...	...	83	68	13	...	...	...	...	..	22·09	2·68
Teluk Anson ...	...	...	82·17	94	70	22	76·93	859	...	78	...	5·77	1·87
Tapah ...	...	...	81·80	94	67	27	76·47	842	...	78	...	12·11	1·46
Parit Buntar ...	...	...	82·74	92	63	28	76·67	839	...	75	...	5·31	1·90
Bagan Serai ...	...	...	83·05	92	69	23	77·18	850	...	76	...	8·96	2·70
Selama ...	...	...	82·27	92	70	22	77·23	868	...	79	...	11·26	3·50

State Surgeon's Office,
Taiping, 12th April, 1905.

M. J. WRIGHT,
State Surgeon.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of February, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·897	151·1	79·8	89·3	70·7	18·6	75·6	0·816	73·1	81	S.W.	6·23	1·90
Pudoh Gaol Hospital „	...	...	...	...	...	...	...	...	...	...	...	8·82	...
District Hospital „	...	...	...	...	...	...	...	...	...	...	...	7·78	2·40
„ Klang	...	...	...	87·1	70·5	16·6	...	...	...	...	...	7·22	1·75
„ Kuala Langat	...	...	...	86·8	72·6	14·2	...	...	...	...	...	6·65	1·26
„ Kajang	...	...	...	93·2	71·2	22·0	...	...	...	...	...	6·20	1·56
„ Kuala Selangor	...	...	...	87·3	74·3	13·0	...	...	...	...	...	2·67	1·10
„ Kuala Kubu	...	...	...	90·6	70·4	20·2	...	...	...	...	...	5·80	2·04
„ Serendah	...	...	...	90·1	75·7	14·4	...	...	...	...	...	5·62	1·46
„ Rawang	...	...	...	86·3	69·5	16·8	...	...	...	...	...	6·47	1·65
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	4·34	2·24
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	..	3·77	1·00

STATE SURGEON'S OFFICE,
Kuala Lumpur, 20th March, 1905.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of March, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·884	147·2	81·6	92·0	71·4	20·6	76·1	0·803	72·6	74	Calm.	6·08	1·70
Pudoh Gaol Hospital, „	...	...	...	...	...	...	...	...	...	...	...	6·18	1·13
District Hospital, „	...	...	...	...	...	...	...	...	...	...	...	3·71	0·67
„ Klang	...	...	...	88·4	70·9	17·5	...	...	...	...	...	4·74	1·49
„ Kuala Langat	...	...	...	89·1	74·0	15·1	...	...	...	...	...	0·26	0·20
„ Kajang	...	...	...	95·5	72·1	23·4	...	...	...	...	...	7·03	2·02
„ Kuala Selangor	...	...	...	89·6	75·1	14·5	...	...	...	...	...	3·18	0·92
„ Kuala Kubu	...	...	...	93·5	72·3	21·2	...	...	...	...	...	5·22	1·24
„ Serendah	...	...	...	91·1	76.8	14·3	...	...	...	...	...	3·58	0·85
„ Rawang	...	...	...	87·5	65·8	21·7	...	...	...	...	...	5·63	1·15
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	1·03	0·51
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	...	2·27	0·97

STATE SURGEON'S OFFICE,

Kuala Lumpur, 17th April, 1905.

E. A. O. TRAVERS,

State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for the month of February, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis ...	...	...	...	93·0	67·0	17·60	...	...	...	...	...	4·46	·95
Raub ...	...	...	...	90·0	64·0	17·25	...	...	...	...	...	7·23	3·60
Bentong ...	...	...	...	92·0	68·5	16·34	...	...	...	...	...	4·39	·86
Temerloh ...	...	...	...	92·0	71·0	21·0 *	...	...	...	...	...	5·38	1·36
Pekan ...	...	...	...	92·0	66·0	11·37	...	...	...	...	...	22·07	3·85
Kuala Kuantan ...	...	...	...	92·0	64·0	17·8	...	...	...	...	...	5·54	1·24
Sungei Lembing ...	...	...	...	87·0	62·0	25·0 *	...	...	...	...	...	12·63	4·15

Kuala Lipis,
23rd March, 1905.

S. LUCY,
State Surgeon, Pahang.

* Maximum Range.

Muar.

Abstract of Meteorological Readings for the month of March, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Lanadron Estate ...	...	...	83°	93°	71°	22°	75°	...	...	...	...	7·43	2·28

Muar, 6th April, 1905.

ROGER PEARS.

The Duff Development Concession Limited, Kelantan.

Abstract of Meteorological Readings for the month of March, 1905.

District.	Temperature.			Rainfall.	
	Mean Maximum.	Mean Minimum.	Mean Range.	Total Rainfall.	Greatest Rainfall during 24 hours.
	°F	°F	°F	Inches.	Inches.
Kuala Lebir ...	93·1	70·4	22·7	·79	·26
Ulu Liang ...	81·9	71·2	10·7	3·39	1·73
Serasa ...	91·6	72·0	19·6	4·69	1·29
Kuala Kelantan ...	86·3	73·3	13·0	1·76	·92

April 6th, 1905.

JOHN D. GIMLETTE.

METEOROLOGICAL OBSERVATIONS.

Table Showing the Daily Results of the Reading of Meteorological Observations taken at the General Hospital, Seremban, For the Month of February, 1905.

Date.	Temperature of radiation.						Temperature of radiation.				Wind. Direction.		Temperature of evaporation.			Computed vapour tension.			Relative humidity.			Clouds 0 to 10.			Cloud and weather initials.			Rain.
	9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Sun.	Difference sun and shade.	Grass.	Difference shade and radiation.	9 H	15 H	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	21 H	9 H	15 H	21 H	Inches.
	°	°	°	°	°	°	°	°	°	°			°	°					°	°	°							
1	77	87	82	87	68	19	157	70	65	3	E.	S.E.	72·3	73·9	73·1	0·793	0·837	0·815	94	65	79·5	2	2	2	B	B	B	
2	77	86	89·5	86	69	17	137	51	67	2	E.	S.E.	71·9	74·2	73	·783	·855	·818	84	68	76	3	5	5	C	C	C	
3	75	85	80	88	68	20	158	70	67	1	E.	S.E.	69·8	71·8	70·8	·731	·781	·756	84	64	74	2	10	5	B	R	C	
4	75	85	80	88	67	21	158	70	65	2	N.E.	S.E.	65·1	75·2	70·6	·620	·873	·746	67	72	69·5	3	2	2	C	B	B	
5	78	88	83	90	67	23	160	70	67	0	E.	S.E.	69·5	73·3	71·9	·722	·819	·770	75	61	68	2	0	0	B	B	B	
6	78	88	83	88	68	20	159	71	68	0	S.E.	S.E.	71·2	71·6	71·4	·765	·775	·770	79	58	68·5	0	0	0	B	B	B	
7	76	87	81·5	89	67	22	156	67	65	2	E.	S.E,	70·9	72·2	71·5	·756	·792	·774	84	61	72·5	0	0	0	B	B	B	
8	78	89	83·5	89	67	22	157	68	66	1	E.	S.E,	72·9	71·1	72	·810	·757	·783	84	55	69·5	0	0	3	B	B	C	·79
9	80	89	84·5	89	72	17	155	66	69	3	N.E.	E.	71·6	71·1	71·3	·775	·757	·766	75	55	65	0	3	3	B	C	C	
10	77	83	80	83	73	10	120	37	69	4	S.E,	E.	73·6	69·7	71·6	·829	·724	·776	89	64	76·5	3	3	3	C	C	C	
11	74	81	77·5	82	73	9	123	41	68	5	N.E.	E.	72·3	72·6	72·4	·793	·802	·797	94	76	85	3	3	3	C	C	C	
12	75	83	79	85	72	13	145	60	69	3	E.	E.	71·6	69·7	70·6	·774	·724	·744	89	64	76·5	5	3	10	C	C	R	
13	79	84	81·5	86	72	14	160	74	69	3	N.E.	N.E.	72·3	72·4	72·3	·793	·794	·793	80	68	74	3	2	0	C	B	B	
14	77	77	77	86	72	14	152	66	69	3	E.	E.	72·3	70·2	71·2	·793	·739	·766	94	79	86·5	0	3	3	B	C	C	
15	78	85	81·5	86	72	14	145	59	69	3	E.	E.	71·2	66·8	69	·765	·660	·712	79	55	67	0	0	0	B	B	B	
16	74	77	75·5	88	72	16	188	00	69	3	N.E.	E.	72·3	73·6	71·9	·793	·829	·811	94	89	91·5	3	3	0	C	C	B	
17	79	82	80·5	87	69	18	165	78	67	2	E.	E.	67·2	70·3	68·7	·666	·744	·704	67	68	67·5	0	3	0	B	C	B	
18	79	80	79·5	87	69	18	120	33	67	2	E.	E.	65·5	71·6	68·5	·728	·775	·701	63	75	69	0	0	0	B	B	B	
19	78	80	79	87	69	18	150	63	65	4	E.	E.	72·9	71.6	72·2	·810	·775	·792	84	75	79·5	3	2	0	C	B	B	
20	80	87	83·5	89	68	21	160	71	65	3	E.	E.	71·6	75·5	73·5	·775	·884	·829	75	69	72	0	0	0	B	B	B	
21	80	87	83·5	89	70	19	160	71	67	3	E.	E.	71·6	75·5	73·5	·775	·884	·829	75	69	72	0	0	0	B	B	B	
22	83	83	83	89	71	18	158	69	67	4	E.	N.E.	73	73	73	·810	·810	·810	72	72	72	0	3	10	B	C	R	·55
23	76	86	81	89	73	16	165	76	69	4	E.	S.E.	74·3	74·2	74·2	·848	·855	·851	94	68	81	0	3	3	B	C	C	
24	80	77	78·5	89	74	15	161	72	70	4	S.E.	E.	73·3	71·9	72·6	·820	·783	·801	80	84	82	0	10	5	B	R	C	·84
25	77	78	77·5	90	72	18	165	75	71	1	E.	E.	73·6	74·6	74·1	·829	·857	·843	89	89	89	0	10	3	B	R	C	·26
26	78	88	83	89	73	16	155	66	71	2	E.	S.E.	72·9	74·9	73·9	·810	·865	·837	84	65	74·5	0	0	0	B	B	B	
27	78	89	83·5	90	72	18	163	73	71	1	S.E.	N.E.	74·6	74·3	74·4	·857	·847	·852	89	61	75	0	0	0	B	B	B	
28	78	86	82	87	74	13	165	78	71	3	E.	S.E,	74·6	74·2	74·4	·857	·855	·856	89	68	78·5	3	5	5	C	C	C	

Total 2·44

STATE SURGEON'S OFFICE,
Seremban, 11th March, 1905.

R. VAN GEYZEL,
Apothecary.

No. 4.] APRIL, 1905. [VOL. IV.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,
Director of Botanic Gardens, S. S.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.

AGRICULTURAL BULLETIN
OF THE
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AND
FEDERATED MALAY STATES.

No. 4.] APRIL, 1905. [VOL. IV.

DECLINE IN RUBBER.

YIELD IN VARIOUS PARTS OF THE WORLD.

The rapid disappearance of wild rubber in many parts of the world is becoming more and more striking as years go by. The heavy demand for rubber of all sorts has nearly exhausted all the accessible forests of wild rubber plants. In nearly all cases, the rubber collector quite destroys the tree or creeper, so that, should the forests be even full of seedlings, it will be a very long time before these are fit to produce rubber. Moreover, the destruction of the plants means the destruction of the seeds, as few or no seed-bearers are left. It is in this way that several other jungle-products have been almost or quite exterminated. The rubber trade has been living almost exclusively on jungle rubber, and has attained thus enormous proportions. Now comes a still greater increase of demand and a very rapid failure of supply. Some recent rubber statistics published in the *India Rubber World* (February 1st, 1905), show this collapse of the world supply very clearly.

Thus, the export of rubber from Burmah in 1892-1893 was 1,116,864 pounds, decreasing to 1,038,240 in 1895, with a sudden drop to 801,248 in 1896, and a steady decline to 200,704 pounds in 1903-1904.

In Bolivia, in 1900, 7,691,728 pounds were exported, with a rapid steady decline to 2,906,274 in 1903.

British Central Africa exported in 1901-1902, 14,393½ pounds, 11,723 next year, and last year, 4,262. Southern Nigeria, in 1901, 1,740,156 pounds; in 1903, 1,177,803.

Portuguese East Africa seems to have increased a little, but the amount exported is small, and there is an increase in impure cooked rubber and a diminution in better grades.

In British Honduras, there has been a steady fall from 55,331 in 1899 to 22,176 in 1903.

Considering the increased prices and demands during these last few years, which would naturally produce a larger supply if it was to be had, we may take it that this falling off in jungle rubber is due to the extermination of rubber plants in all these, and indeed several other countries. Statistics like these ought to be enough to calm the minds of those who are scared by the idea of over-production.

Another article in the same Number gives an account of the consumption of rubber in America. This has increased in 1904 to 27,623 tons as against 24,760 in 1903. In fact, it is clear that the demand is increasing all over the world, and it is important in the interests of all, from planter to consumer, that the cultivation should spread as far as it can.

RUBBER EXPERIMENTS IN THE BOTANIC GARDENS, SINGAPORE.

We give in this number the continuation of the experiments on Para rubber trees in the Botanic Gardens, carried out last year and part of this one. This series of returns and calculations constitutes the result of Experiment V. The next Number of the *Bulletin* will contain the results of Experiment VI, the last of this series, and will be followed by a summary of the results.

Experiment V.

MORNING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.		Augt.	*					
200		1 7		12	2					
205		1 8¾	Herring-bone.	15	3¾					
			Every other day.	17	2½					
206		1 6½		19	4¼					
207		1 8¾		22	5½					
				24	4					
209		1 8¾		26	2¾					
331	I. Group I.	1 11¼		29	2¼	15	46 ozs. $2\frac{14}{16}$ lbs.	ozs. $4\frac{6}{10}$	Under ¼ ounce.	
				1	3					
332		1 10¾		3	2¾					
333		1 10¾		6	5					
				8	3					
337		1 11		12	1					
341		1 9½		14	2¼					
				16	2					
	Aggregate Girth ...	17 9 †								

---

* Nearly dry biscuit rubber.

† Each tree between 1 foot 6 inches and 2 feet girth.

Experiment V.

MORNING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.		Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft.	in.		Nov.	*					
					14	3¾					
475		1	5¼	Herring-bone.							
					16	2½					
481		1	8	Every other day.	18	5					
484		1	10½		21	3¾					
496		1	6¾		23	3					
					25	3					
497	I.	1	10		28	2½					
498	Group II.	1	11¼		30	4½					
500		1	9¾		Dec.						
501		1	9¼		2	3	15	46¼ ozs. $2\frac{14\frac{1}{4}}{16}$ lbs.	$4\frac{6}{10}$ ozs.	Under ¼ ounce.	
505		1	5¾		5	3¾					
					7	2¾					
519		1	11		10	1¾					
					13	2					
	Aggregate Girth ...	17	3½†		15	3					
					17	2					

* Nearly dry rubber. † Each tree under 2 feet girth.

Experiment V.

MORNING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.								
				Nov.	*					
555		2 2¼	Herring-bone.							
				21	1½					
561		2 5½	Every other day.							
				23	5½					
567		2 2½		25	7¾					
				28	6¾					
569		2 1¼								
				30	7¾					
572	II.	2 3		Dec.						
				2	2¾					
576	Group I.	2 1								
				5	6					
587		2 1⅝		7	4	17	76½ ozs. $4\frac{12\frac{1}{2}}{16}$ lbs	$7\frac{6}{10}$ ozs.	Over ¼ ounce.	Rain.
				10	5¼					
594		2 6								
				13	4½					
609		2 2⅛		15	6					
625		2 1¾		17	3					
				19	3½					
	Aggregate Girth ...	22 3 †		21	2½					
				23	3½					
				26	3¼					
				28	3					

* Nearly dry rubber.

† Each tree between 2 feet and 2 feet 6 inches girth.

Experiment V.

MORNING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.		Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft.	in.		Nov.	*					
					22	2¾					
639		2	4	Herring-bone.	24	7					
641		2	4⅞	Every other day.	26	8½					
645		2	4¾		29	9½					
					Dec.						
648		2	3¼		1	8½					
652	II.	2	0¼		3	6¼					
					6	7¾					
657	Group II.	2	4¾		8	4¾					
662		2	5		12	5½	17	92¾ ozs. $5\frac{12\frac{3}{4}}{16}$ lbs.	$9\frac{2}{10}$ ozs.	Over ¼ ounce.	
					14	7¼					
664		2	1¾		16	5¾					
669		2	0¾		18	3½					
					20	3					
670		2	4¾		22	4					
					24	3					
	Aggregate Girth ...	22	10 †		27	2½					
					29	3¼					

* Nearly dry rubber.

† Each tree between 2 feet and 2 feet 6 inches girth.

Experiment V.

MORNING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.		Nov.	*					
508		2 11¼	Herring-bone.	12	5					
				15	8¾					
513		2 9¾	Every other day.	17	7¾					
				19	8½					
528		2 7¼		22	8½					
529		3 0		24	9¼					
				26	11¼					
532	III.	2 8¾		29	10¼					
				Dec.						
534	Group I.	2 8¾		1	11½	19	148½ ozs. $9\frac{4\frac{1}{2}}{16}$ lbs.	$14\frac{8}{10}$ ozs.	Under ½ ounce.	
539		2 10¼		3	7½					
				6	8¼					
556		2 6½		8	5¾					
559		2 7⅛		12	7½					
				14	9½					
560		2 8¾		16	8¾					
	Aggregate Girth ...	27 6¼ †		19	7					
				21	6¼					
				23	5½					
				26	1¾					

* Nearly dry rubber.

† Each tree between 2 feet 6 inches and 3 feet girth.

Experiment V.

MORNING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
				Nov.	*					
		Ft. in.		14	4¾					
563		2 9¾	Herring-bone.	16	8					
				18	9½					
564		2 10¼	Every other day.	21	8¾					
566		2 6½		23	10¼					
				25	8					
573		2 9¾		28	11¼					
575	III. Group II.	2 6¾		30	10					
585		2 7½		Dec. 2	5½					
				5	9¼	19	124¾ ozs.	$12\frac{4}{10}$ ozs.	Under ½ ounce.	Rain.
586		2 6¾		7	8½		$7\frac{12\frac{3}{4}}{10}$ lbs.			
593		2 10		10	4¾					
				13	4¼					
599		2 11⅞		15	4½					
602		2 8		17	4¼					
	Aggregate Girth ...	27 3 †		20	2½					
				22	3¼					
				24	3					
				27	4½					

* Nearly dry rubber.

† Each tree between 2 feet 6 inches and 3 feet girth.

Experiment V.

MORNING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
				Nov.	*					
		Ft. in.		21	6½					1904
				23	8¾					
54		3 8½	Herring-bone.	25	14¾					
				28	16¾					
56		3 9¼	Every other day.	30	14½					
				Dec.						
57		3 9		2	4					Rain.
				5	14¼					
111		3 7½		7	16¼					
				10	13½					
112	IV. Group I.	3 11		13	16					
				15	15		258¼ ozs.	1 lb.		
118		4		17	9½	24	$16\frac{2\frac{1}{4}}{16}$ lbs.	$9\frac{8}{10}$ ozs.	Over ½ ounce.	
				19	12½					
122		3 10¼		21	12½					
				23	11¾					
138		3 10¼		26	9¼					
				28	10¾					
142		3 6¼		30	6½					1905
				Jan.						
143		3 10		3	6¾					
				5	7½					
	Aggregate			7	8					
	Girth ...	37 10 †		10	6¾					
				12	8¼					
				14	8					

* Nearly dry rubber.

† Each tree between 3 feet 6 inches and 4 feet girth.

Experiment V.

MORNING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.		Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
					Nov.	*					
		Ft.	in.		22	$11\frac{1}{2}$					1904.
					24	$12\frac{3}{4}$					
158		3	$7\frac{1}{4}$	Herring-bone	26	$13\frac{1}{2}$					
					29	$15\frac{1}{2}$					
159		3	$10\frac{1}{2}$	Every other day.	Dec.						
					1	19					
161		3	$6\frac{1}{2}$		3	15					
					6	17					
173		3	$11\frac{3}{4}$		8	15					
	IV.				12	$12\frac{1}{4}$					
176		3	10		14	$18\frac{3}{4}$					
	Group.				16	$19\frac{3}{4}$					
193		3	$7\frac{3}{4}$		18	8	24	$277\frac{1}{2}$ ozs.	lbs. 1.	Over $\frac{1}{2}$ ounce.	
	II.				20	$10\frac{1}{4}$		$17\frac{5\frac{1}{2}}{16}$ lbs.	$11\frac{7}{10}$ ozs.		
197		3	$6\frac{3}{4}$		22	$10\frac{3}{4}$					
					24	$10\frac{3}{4}$					
201		4	0		27	$7\frac{1}{4}$					
					29	$8\frac{3}{4}$					
220		3	7		31	8					
					Jan.						1905.
226		3	9		4	9					
	Aggregate				6	$9\frac{1}{2}$					
	Girth ...	37	$4\frac{1}{2}$ †		9	7					
					11	$6\frac{3}{4}$					
					13	$6\frac{1}{4}$					
					15	$5\frac{1}{4}$					

* Nearly dry rubber.

† Each tree between 3 feet 6 inches and 4 feet girth.

Experiment V.

MORNING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
				Nov.	*					1904
		Ft. in.		21	10					
				23	13¼					
39		4 8	Herring-bone.	25	18¾					
				28	18¼					
60		4 10	Every other day.	30	22¼					
				Dec.						Rain.
81		4 9½		2	3¾					
				5	19¼					
127		4 7½		7	21¾					
				10	13½					
222	V. Group I.	4 9		13	19	24	348½ ozs. lbs. 21 $\frac{12\frac{1}{4}}{16}$ ozs.	2 lbs. $2\frac{8}{10}$ ozs.	Over ½ ounce.	
				15	24					
232		4 11		17	17¾					
				19	18¾					
373		4 7½		21	16¼					
				23	12					
387		4 7¾		26	12¼					
				28	13¼					
403		4 9		30	13					
				Jan.						1905
414		4 8½		3	10					
	Aggregate Girth ...	47 3¾†		5	15¾					
				7	10					
				10	8¼					
				12	8¼					
				14	9¼					

* Nearly dry rubber.

† Each tree between 4 feet 6 inches and 5 feet girth.

Experiment V.

MORNING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
				Nov.	*					1904.
		Ft. in.		22	9½					
				24	15½					
426	V.	4 11¼	Herring-bone.	26	17					
				29	15½					
440	Group II.	4 6½	Every other day.	Dec.						
				1	22¾					
478		4 9¾		3	18¼					
				6	21¼					
480		4 8		8	17¼					
				12	16¼					
495		4 8¾		14	20½	24	335½ ozs.	lbs. 2.1½	Over ½ ounce.	
				16	20¼		$20\frac{15\frac{1}{2}}{16}$ lbs.	ozs.		
512		4 7		18	15					
				20	15½					
514		4 9		22	16					
				24	11¾					
526		4 7¼		27	9¼					
				29	11					
858		4 11¾		31	12½					
				Jan.						1905.
859		4 10½		4	10					
				6	10¾					
				9	7					
	Aggregate Girth ...	47 5¾†		11	7¼					
				12	8¾					
				15	6¾					

* Nearly dry rubber.

† Each tree between 4 feet 6 inches and 5 feet girth.

Experiment V.

EVENING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.		Mode of Incision.	Date.	Amount.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
						Ounces.					
		Ft.	in.		Nov.	*					
					11	2½					
520		1	4½	Herring-bone.							
					14	4					
530		1	4¾	Every other day.	16	4¾					
					18	4½					
531		1	10¼								
					21	4					
537		1	8½		23	4					
					25	4½					
545	I Group I.	1	9¼		28	4					
546		1	11¾		30	3¾	15	52¾ ozs. $3\frac{4\frac{3}{4}}{16}$ lbs.	5⅕ ozs.	Over ¼ ounce.	
547		1	10¾		Dec.						
					2	3					
552		1	5½								
					5	3					
557		2			7	4¾					
					10	2¾					
565		1	10¼								
					13	1¾					
					15	1½					
	Aggregate Girth ...	17	3½ †								

* Nearly dry rubber.

† Each tree under 2 feet girth.

Experiment V.

EVENING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount, Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.		Nov.	*					
				12	3					
568		1 11¾								
				15	3½					
570		1 9¼	Herring-bone.	17	3¼					
				19	4¼					
574	I.	1 10	Every other day.							
				22	3					
578	Group II.	1 11½		24	2½					
				26	2¾					
580		1 9¾								
				29	3¼					
581		1 8⅛		Dec.		15	40 ozs.= 2½ lbs.	4 ozs.	Under ¼ ounce.	
				1	1¾					
596		1 9⅞								
				3	3¾					
601		2		6	2¼					
				8	2					
623		1 7								
				12	1¾					
624		1 11⅞		14	1¾					
				16	1¼					
	Aggregate Girth ...	18 5 †								

* Nearly dry rubber. † Each tree between 1 foot 6 inches and 2 feet girth.

Experiment V.

EVENING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.		Nov.	*					
			Herring-bone.	18	1					
673		2 5¾								
			Every other day.	21	1½					
694		2 5¾		23	3½					
				25	4					
713		2 5½								
				28	4¼					
718		2 5¾		30	4¾					
				Dec.						
734		2 2¼								
				2	4					
740	II. Group I.	2 2½		5	3½	17	47¼ ozs.	$4\frac{7\frac{1}{4}}{10}$ ozs.	Under ¼ ounce.	
				7	3½		$2\frac{15\frac{1}{4}}{16}$ lbs.			
749		2 4¼								
				10	2½					
751		2 6		13	3½					
				15	2					
752		2 6								
				18	1					
824		2 3⅛		20	1¾					
				22	2					
	Aggregate Girth ...	23 10¾ †		24	1¾					
				27	2¾					

* Nearly dry rubber.

† Each tree between 2 feet and 2 feet 6 inches girth.

Experiment V.

EVENING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.		Nov.	*					
				19	1					
762		2 4¾	Herring-bone.	22	2					
765		2 4¾	Every other day.	24	4					
				26	5					
770		2 3⅛		29	3¾					
781		2 2½		Dec.						
				1	2½					
783	II. Group II.	2 2¾		3	2					
786		2 0½		6	3½					
804		2 4½		8	4¼	17	46½ ozs. $2\frac{14\frac{1}{2}}{16}$ lbs.	$4\frac{6\frac{1}{2}}{10}$ ozs.	Under ¼ ounce.	
				12	2¼					
808		2 1½		14	3¼					
				17	1					
809		2 2		19	2¾					
818		2 6		21	2½					
				23	1¾					
	Aggregate Girth ...	22 8¼ †		26	1¾					
				28	3¼					

* Nearly dry rubber.

† Each tree between 2 feet and 2 feet 6 inches girth.

Experiment V.

EVENING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.		Nov.	*					
				11	½					
614		2 8	Herring-bone.	14	3¾					
				16	5½					
615		2 7	Every other day.	18	6¼					
616		2 10½		21	6½					
				23	8½					
636		2 8¼		25	7¾					
649		2 10¼		28	6½					
	III.			30	8¾	19	100¾ ozs.	10 ozs.	Over ¼ ounce.	
650	Group I.	2 7¾		Dec.			$6\frac{4\frac{3}{4}}{16}$ lbs.			
653		2 6½		2	9					
				5	4½					
661		2 6¼		7	7					
				10	4					
663		2 11		13	5½					
672		2 6¾		15	3½					
				19	3½					
	Aggregate Girth ...	26 10¼ †		21	4¼					
				23	2½					
				26	3					

* Nearly dry rubber.

† Each tree between 2 feet 6 inches and 3 feet girth.

Experiment V.

EVENING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
				Nov.	*					
		Ft. in.		12	3¼					
678		2 10¾	Herring-bone.	15	4¾					
				17	4¼					
683		2 8¾	Every other day.	19	4¾					
689		2 7		22	4					
				24	5½					
692		2 10¼		26	4					
703	III.	2 6½		29	5½					
	Group.			Dec.						
704		2 7¾		1	4	19	78½ ozs. 4 $\frac{14\frac{1}{2}}{16}$ lbs.	7$\frac{8}{10}$ ozs. 4 $\frac{14\frac{1}{2}}{16}$ lbs.	About ¼ ounce.	
	II.			3	3¾					
705		2 7½		6	4½					
711		2 8¾		8	5½					
725		2 6¼		12	3½					
				14	3½					
737		2 5 ‡		17	3¼					
				20	2½					
	Aggregate Girth ...	26 6½ †		22	4½					
				24	4					
				27	3½					

* Nearly dry rubber. † Each tree between 2 feet 6 inches and 3 feet girth. ‡ Crept in through error.

Experiment V.

EVENING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
				Nov.	*					
		Ft. in.		18	8					1904.
				21	6					
227		3 10¾	Herring-bone.	23	11½					
				25	13¾					
235		3 10½	Every other day.	28	15¼					
				30	17½					
254		3 7		Dec.						
				2	14					
262		3 6½		5	14					
				7	13					
285	IV.	3 7¼		10	12					
	Group I.			13	14½					
286		3 9¼		15	13¼					
				18	9¾	24	237½ ozs 14$\frac{13\frac{1}{2}}{16}$ lbs.	1·7$\frac{7}{10}$ lbs.	Over ½ ounce.	
295		3 6½		20	7¾					
				22	9¾					
303		3 8		24	7¾					
				27	9					
334		3 11		29	7½					
				30	7¾					
339		3 9		Jan.						
				4	7¼					1905.
				6	5					
	Aggregate Girth ...	37 1¾†		9	4¼					
				11	4½					
				13	4½					

* Nearly dry rubber. † Each tree between 3 feet 6 inches and 4 feet girth.

Experiment V.

EVENING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
				Nov.	*					1904.
		Ft. in.		19	7¼					
				22	6¾					
361		4 0	Herring-bone.	24	15					
				26	17					
363		3 7	Every other day.	29	17¼					
				Dec.						
370		3 8		1	17					
				3	10½					
379		3 9¼		6	13½					
				8	7¾					
396	IV.	3 9½		12	13½					
				14	14¾					
398	Group II.	3 6½		17	15¼	24	240¼ ozs.	1 lbs.	Over ½ ounce.	
				19	11		15 $\frac{0\frac{1}{4}}{16}$ lbs.	8 ozs.		
404		3 7½		21	8¼					
				23	7¾					
406		3 6½		26	7½					
				28	7½					
407		3 8		30	7½					
				Jan.						1905.
428		3 7¼		3	7					
	Aggregate Girth ...	36 9½†		5	6½					
				7	5½					
				10	5¾					
				12	5½					
				14	5					

* Nearly dry rubber.

† Each tree between 3 feet 6 inches and 4 feet girth.

Experiment V.

EVENING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.		Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft.	in.		Nov.	*					
					18	5½					
543		4	9¼	Herring-bone.	21	5¾					
					23	13½					
583		4	8	Every other day.	25	15					
					28	13¾					
631		4	8½		30	15¼					
					Dec.						
634		4	8½		2	16½					
					5	12¼					
684	V.	4	8½		7	9½					
					10	15¾					
687	Group I.	4	8		13	13	24	$277\frac{3}{4}$ ozs.	$1.11\frac{7\frac{3}{4}}{10}$	About ½ ounce.	
					15	13					
696		4	6¼		18	7¾		$17\frac{5\frac{3}{4}}{16}$ lbs.	lbs.		
					20	10¼					
700		4	9		22	12¾					
					24	9¾					
707		4	7		27	12½					
					29	13¼					
727		4	9⅝		31	8					
					Jan.						
	Aggregate				4	10					
	Girth ...	46	10½†		6	10½					
					9	7½					
					11	13¼					
					13	13½					

* Nearly dry rubber.

† Each tree between 4 feet 6 inches and 5 feet girth.

Experiment V.

EVENING.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
				Nov.	*					1904.
		Ft. in.		19	6¾					
				22	11¾					
731		4 7	Herring-bone	24	16					
				26	10¼					
735		4 8	Every other day.	29	13					
				Dec.						
743		4 6¾		1	19½					
				3	10					
746		4 9		6	13					
	V.			8	9¾					
763		4 8½		12	13¼					
	Group II.			14	14¼	24	252¾ ozs.	1.9$\frac{2\frac{3}{4}}{10}$ lbs.	Under ½ ounce.	
777		4 9¼		17	12½		15$\frac{12\frac{3}{4}}{16}$ lbs.			
				19	8¾					
778		4 8¾		21	9					
				23	7½					
823		4 7½		26	7¾					
				28	10					
842		4 7½		30	10¾					
				Jan.						
851		4 7¾		3	9					1905.
	Aggregate Girth ...	46 8 †		5	9½					
				7	7¼					
				10	7¾					
				12	6¾					
				14	8¾					

* Nearly dry rubber. † Each tree between 4 feet 6 inches and 5 feet girth.

Experiment V. Result.

MORNING.						EVENING.					
Working Number.	Groups.	Aggregate Girth.		Total Yield.		Working Number.	Groups.	Aggregate Girth.		Total Yield.	
		Feet.	Inches.	lbs.	ozs.			Feet.	Inches.	lbs.	ozs.
I	I	17	9	2	14	I	I	17	3½	3	4¾
,,	II	17	3½	2	14¼	,,	II	18	5	2	8
II	I	22	3	4	12½	II	I	23	10¾	2	15¼
,,	II	22	10	5	12¾	,,	II	22	8¼	2	14½
III	I	27	6¼	9	4½	III	I	26	10¼	6	4¾
,,	II	27	3	7	12¾	,,	II	26	6½	4	14½
IV	I	37	10	16	2¼	IV	I	37	1¾	14	13½
,,	II	37	4½	17	5½	,,	II	36	9½	15	0¼
V	I	47	3¾	21	12½	V	I	46	10½	17	5¾
,,	II	47	5¾	20	15½	,,	II	46	8	15	12¾
Total Girth	...	304	10¾	109	10½	Aggregate Girth	...	303	2	85	14

Morning, 100 trees, aggregate girth, 304 feet 10¾ inches, produced 109 lbs. 10½ ozs. } Dry rubber.
Evening, 100 ,, ,, ,, 303 feet 2 inches ,, 85 lbs. 14 ozs, }

Rainfall from October to December, 1904.

October.			November.			December.		
Date.	Inches.	Parts.	Date	Inches.	Parts.	Date.	Inches.	Parts.
1	...	18	1	...	22	1	...	...
2	...	...	2	...	54	2	...	61
3	...	22	3	...	64	3	...	...
4	1	00	4	...	76	4	...	45
5	...	05	5	1	38	5	...	56
6	...	...	6	1	36	6	...	...
7	...	...	7	...	04	7	...	25
8	...	...	8	...	10	8	...	30
9	...	...	9	...	...	9	...	...
10	...	...	10	...	...	10	...	...
11	...	44	11	...	12	11	...	71
12	...	46	12	...	...	12	...	71
13	...	74	13	...	23	13	...	25
14	...	24	14	...	...	14	...	46
15	...	37	15	...	...	15	...	48
16	...	...	16	...	...	16	2	50
17	...	...	17	...	...	17	...	63
18	...	04	18	...	21	18	...	06
19	...	12	19	...	...	19	...	74
20	...	51	20	...	...	20	...	...
21	...	...	21	...	...	21	...	...
22	...	...	22	...	...	22	...	...
23	...	...	23	...	90	23	...	...
24	...	...	24	...	...	24	...	...
25	...	11	25	...	...	25	...	85
26	...	06	26	...	...	26	...	...
27	...	50	27	...	...	27	...	...
28	...	07	28	...	...	28	...	...
29	...	54	29	2	90	29	...	...
30	...	...	30	...	80	30	...	...
31	1	83				31	...	42
Total ...	7	48	Total ...	10·20		Total ...	9	98

THE DRYING OF RUBBER.

I cannot say that I altogether like the method Mr. BURGESS proposes for the drying of rubber. Calcium chloride is at the best a very expensive material to use in this connection, and with its use comes the danger of accidental contamination with the rubber. Very great care would require to be exercised that not a particle of it got into contact with the rubber, for the evil resulting would be very great. Of the two methods he proposes, certainly the circulation of dried air is by far the better, but this could be obtained more safely and more economically than by the use of calcium chloride. I have no intimate knowledge of how careful the native labourers are, but from what I have heard, I would be disposed to think that sooner or later accidents would happen and a batch of rubber be spoiled by admixture with this chemical. I still remain of opinion that the system of drying in vacuum is by far the best suited to the needs of the planter. As Mr. BURGESS is in a much better position than I am to conduct practical experiments on this, I would gladly give him any details and help that I can. So far as I can see, no difficulties stand in the way, and the drying is brought about so rapidly as to be economical, and the machine so arranged as to be practically "fool-proof." I shall be glad if Mr. BURGESS will communicate with me in regard to this and other matters.

Sir W. THISELTON DYER.

India-Rubber Journal, Vol. XXIX, p. 173.

I do not think that there is much fear, as suggested by Sir WILLIAM THISELTON DYER, that the calcium chloride process will in any way cause risk of injury to the rubber during the course of drying. We have here been using the chemical in a make-shift way in small trays put into drawers with the rubber, and cannot say that even handled by Malay boys we have had any serious accidents with it. In cases where a little slopped over the rubber it produced a patch of stickiness. If the calcium chloride is cleaned off immediately it does no harm. If left on, however, it destroys the rubber by making a sticky soft patch. But, in a manufactory on a large scale, where the calcium chloride would be in pans, well away and above the rubber, there need be no risk. The whole apparatus could easily be made fool-proof, and there would be no more risk than from fire or any other catastrophe. The expense is not great as the calcium chloride is quite cheap and practically lasts for ever except for a little accidentally wasted by overset or something of that sort.

However, as long as smoked rubber fetches the same price as white biscuits unsmoked, smoking is certainly simpler and about as quick a method of preparation.

But, it will be strange, indeed, if the engineers cannot invent a drying apparatus with unheated air to dry the rubber in the quickest possible time.

Editor.

(*Ceylon Times, March 8th, 1905.*)

CEYLON RUBBER FROM THE MANUFACTURER'S POINT OF VIEW.

CEYLON INFERIOR TO BRAZILIAN RUBBER.

Mr. G. C. S. HODGSON, of Lynnthorpe, Nuwara Eliya, sends us a very interesting report on a small sample of rubber which he sent home to the Director of one of the largest manufacturing rubber companies in Scotland. Mr. HODGSON writes:—"We hear a good deal of brokers' reports, but a report from the actual manufacturer not often. The latter part of the report, I think, most interesting, comparing, as it does Malay, Ceylon, and Brazilian Para. We in Ceylon have, up to the present, considered our rubber the best, but not so the manufacturer. The rubber I sent was from Somerset Estate, Gampola"

The report is as follows:—

"I now return parts of the two samples you recently handed to me. That marked "A" is the best colour as you will see for yourself,and for some manufacturing purposes would be preferable to "B," but for toughness the latter is the better of the two.

I regret that our efforts to make a manufactured sample of each with the balance has failed, owing to the quantity being too small for manipulation, as I was anxious to have showed you them made up in this manner, and also some tensile tests.

Both, however, are excellent quality, and in that respect similar to what is now being regularly imported.

The price which these biscuits have recently realized in the market has varied from 6*s*. to 6*s*.2*d*. per lb., while to-day's price of Brazil Para is 5*s*. 3*d*. per lb.

In arriving at the clean cost to a manufacturer it would be necessary to allow, say, 3 per cent. for loss on the Ceylon biscuits, and 18 per cent. on the Para.

Some few months ago, I carried out experiments to determine the respective merits of Malay States and Ceylon biscuits as compared with Brazil Para. Taking strips of each 3 in. long by $\frac{1}{4}$ in. square, and with a load of $7\frac{1}{2}$ lbs., the following elongations took place:—Malay States, $9\frac{1}{4}$ in.; Ceylon, $10\frac{7}{8}$ in.; Brazilian Para, $13\frac{1}{2}$ in.; so that you will see that the Brazilian Para is much superior to either of the other two. There is not much difference between the Ceylon and Malay, though the former shows up better."

As to differences in tensility, one would much like to know more. The short resumé of the manufacturer's letter quoted above is hardly enough. How many samples of Malay and Ceylon rubber did he examine and how were they prepared? The difference in tensility may be due to age of the trees tapped or to age of the rubber.

Tensility is said to be increased by pulling the rubber about, and stretching it in various directions, which may have been done in one case and not in the other. I am inclined, however, to think that age of trees has most to do with the tensility.

In view of the far higher prices obtained for Ceylon and Malay rubbers over Para, the statement that "the opinion of 'the' manufacturer is against the higher priced article" hardly seems valid. It rather depends on what kind of manufacturer is writing. It is easy to understand that Brazilian Para rubber may be just the thing required by a manufacturer of one class of goods, while East Indian is preferred by another.

RUBBER SALES.

We have received a letter from HECHT LEVIS and KHAN stating that four cases of Para rubber sent from the Botanic Gardens, Singapore and made during the course of the experiments carried on last year and part of this year fetched "the excellent all round price of 6/2 per lb." This, at the date at which it was sold, February 20, is very satisfactory. Since that date, however, we hear of still higher rises in price, 6/6 and 6/7 having been obtained for Ceylon and Perak rubber.

DEATH OF DR. C. WEBER.

All interested in rubber will regret to hear of the sudden death of Dr. CARL WEBER which took place on January 14th. Dr. WEBER'S work on the latex of Castilloa was the most important contribution to the knowledge of the methods of preparation of that rubber, and we had hoped that he would do shortly for Para rubber what he has done for Castilloa, but these hopes have been sadly frustrated.

SANSEVIERA ZEYLANICA.

An unusually large leaf of the Murva fibre plant, *Sanseviera Zeylanica,* was brought to the office of the Botanic Gardens, Singapore, lately. It was a sample of a large quantity of similar leaves found growing at Pulau Kukub, Johore, on the estate of SYED MOHAMMED ALSAGOFF.

The leaf measures 5 feet 2 inches in length and 2 inches across. The plants had in no way been cultivated, but had perhaps more or less accidentally got into remarkably good and rich soil. Among Sago palms. *Sanseviera Zeylanica* usually gives leaves of 3 or 4 feet length at most, but it is clear that in good soil it can attain a much greater size.—*Editor.*

NOTES ON DAMAR-TAPPING PENAK. (BALANOCARPUS MAXIMUS.)

The "damar" of commerce, known to the trade as Damar Mata Kuching, is obtained principally from the Penak tree, and is collected by cutting through the bark down to the cambium. The damar begins to exude in about two days and is ready for collection in from seven to fifteen days; some varieties of Penak give quicker and better returns than others. The collector chips off the damar, which has exuded, with his parang into a receptacle made from the "Palas" leaf, and then reopens the cuts, by cutting off a thin layer of bark.

Trees can be tapped without detriment once a fortnight, but more frequent tapping is apt to cause premature decay of the tree, especially if the cuts penetrate the heartwood rendering the tree liable to attacks of fungus: also the tree should not be "ringed" completely.

The damar exudes more freely in the dry weather.

After collection the damar is picked over by women, and generally placed on the market in two qualities.

The trade is at present in the hands of a few Chinese, who keep prices down; but there is little doubt but that a very much better price could be obtained by direct shipment to Europe.

A few of the more venturesome climb the trees to collect the damar, from the branches, where it sometimes collects in large lumps having exuded naturally due to some injury to the tree; but this is a work of great danger and several fatalities have occurred.

As much as twenty-five catties can be obtained at one tapping; from three hundred cuts, 6″ apart, if the tree is climbed, and damar collected from the branches; but the average yield of a tree is about one catty per month. A good collector can get as much as five catties a day, which he can dispose of to the Chinese dealers, at prices varying from four to eight cents a catty according to quality.

S. W. MOORHOUSE.

Kuala Pilah, 6th March, 1905.

CORRESPONDENCE.

MANGROVES IN THE DINDINGS.

District Office, Dindings,
March 14th, 1905.

The Editor,
Agricultural Bulletin.

Dear Sir,—It may be of interest in connection with Mr. Furnivall's article in the Bulletin for January, on Mangrove Swamps, to note the local names of the various species found in the Dindings. They are as follows:—

Bakau akik.
Bakau Besi or Bakau Pahang, which has a very rough bark and splits unevenly.
Bakau puteh.
Bakau Buros.
Tomoh.
Langgadei and Tengah.

These are all utilised for firewood.

Nerei, Api-api, Perapat and Terrontong are the names of species not used for any purposes. Bakuta and Kadaku are unknown to the Forest Department Officers, probably Terrontong is another name for one of them.

A large quantity of Tengah bark with an admixture of Bakau bark is used locally and exported for tanning purposes.

All the cutters here are Chinese and the general average appears to be about 3,000 billets per mensem per man; the size of these billets is considerably less than 10 katties. No statistics are, however, available on this point as the monthly pass system is in force and no royalty is charged on export.

I am,
Yours faithfully.
R. SCOTT,
Acting District Officer, Dindings.

THE AGRICULTURAL SHOW.

The Annual Agricultural Exhibition of the Straits Settlements and Federated Malay States will be held in Penang at the beginning of August this year. We shall hope to have as fine and interesting an Exhibition as we had last year in Kuala Lumpur.

The committee of the last Exhibition and that of this year's one have set aside $180 each for the initial cost of the medals and diplomas, and the Government of the Straits Settlements has advanced the same amount to be recovered later from future exhibitions Messrs. WATERLOW & SONS are to produce the medals and diplomas.

A list of the winners of medals at the last Show is appended:—

Winners of medals at the Agri-Horticultural Show, Kuala Lumpur, 1904.

Div. A. Class	9	Coconuts, collection of	Goldenhope Estate.
,, ,,	17	Fibres, collection of	Hogan & Co., Ltd.
,, ,,	15	Liberian Coffee	C. & R. S. Meikle.
,, ,,	29	Citronella Oil	Tampin Estate.
,, ,,	30	Coconut Oil	R. D' Silva.

Div. A.	Class	36	Black Pepper	Kamuning Estate.
,,	,,	45	'Para' Rubber (2nd prize)	Sungei Rengum Estate.
,,	,,	53	Sugar Canes, collection of	A. Crawford.
,,	,,	57	Cane Sugar	Caledonia Estate.
Div. C.	,,	6	Fowls, collection of	E. Farrer-Baynes.
Div. E.	,,	30	Embroidery	Raja Muda, L. Perak.
,,	,,	39	Photographs, collection of	H. Melby.

Notice re Agri-Horticultural Show, Kuala Lumpur, 1904.

Successful competitors at the Kuala Lumpur Show, 1904, are requested to note that arrangements have been made for the engraving and sinking of a special die for the medals and diplomas; such medals and diplomas will be presented at the next Show to be held in Penang in August, 1905.

STANLEY ARDEN,
General Secretary, Experimental Plantations,
Selangor, F. M. S.

MISCELLANEOUS.

Notices to Subscribers.

1. For the information of subscribers and others who wish to complete their series of Bulletins, notice is given that numbers 1, 7, 8 and 9, of the old Series (1891 to 1900) and Nos. 1, 8, 9 and 10, of New Series, Vol. I (1901-1902) have been reprinted and copies can be had by all whose subscriptions are paid up to date. The cost to others is 50 cents a number.

2. A very large number of subscriptions, even for last year, are yet unpaid although subscribers have received more than one notice of the delay in payment. As this entails a good deal of extra work on the staff, subscribers are asked to send in their subscriptions without delay. Attention is called to the rule that all subscriptions should be prepaid.

3. Subscribers changing their addresses are requested to give notice to the Editor.

4. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 to cover postage.

Meteorological observers are asked to send in their returns to arrive before the 10th day of the following month, if possible, so as to be in time for going to press.

REGISTER OF RAINFALL AT NEGRI SEMBILAN HOSPITALS, FOR MARCH, 1905.

Date.	Seremban.		K. Pilah.		Tampin.		Jelebu.		Port Dickson.		Mantin.	
	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.
1	...	25	...	...	...	45	...	10	..	...	...	65
2	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	..	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	15	...	...	...	...	...	...
13	...	70	...	...	...	...	...	...	...	...	...	59
14	...	50	...	41	...	40	...	46	...	34	1	27
15	...	20	...	03	...	...	...	47	...	39	...	05
16	...	65	...	67	...	50	1	02	...	...	...	45
17	...	...	...	...	...	...	..	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...
19	...	70	1	31	2	40	...	...	...	...	...	...
20	...	...	...	...	...	35	...	...	...	26	...	...
21	...	...	...	...	...	30	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	..	14	...	05
23	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	09	...	35	...	21	...	...	...	...
25	1	95	...	...	...	25	...	...	...	65	...	...
26	1	60	...	...	...	05	1	40	...	...	...	...
27	...	20	...	18	...	10	...	10	...	...	1	12
28	...	83	...	27	...	05	...	...	...	48	...	02
29	...	...	...	...	...	...	...	...	...	...	...	06
30	...	10	...	...	...	...	...	22	...	10	...	27
31	...	...	...	37	...	...	..	...	...	...	...	...
Total	7	78	4	33	5	35	3	98	2	36	4	53

State Surgeon's Office, Seremban,
13th April, 1905.

R. VAN GEYZEL,
Apothecary.

SINGAPORE MARKET REPORT.

April, 1905.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	31.00	31.00
Bali	...	22.25	22.00
Liberian	138	26.00	24.00
Copra	5,846	8.45	7.80
Gambier	2,843	9.00	8.60
Cube Gambier, Nos. 1 and 2	270	13.25	12.12½
Gutta Percha, 1st quality	...	200.00	150.00
Medium	...	100.00	90.00
Lower	...	80.00	19.00
Borneo Rubber 1, 2, and 3	...	145.00	94.00
Gutta Jelutong	...	7.75	7.25
Nutmegs, No. 110's	...	37.50	34.00
No. 80's	...	58.00	57.00
Mace, Banda	...	82.00	80.00
Amboyna	...	67.00	59.00
Pepper, Black	1,657	26.37½	25.70
White (Sarawak)	250	38.50	37.75
Pearl Sago, Small	30	4.75	4.60
Medium	...	4.50	
Large	...	5.50	
Sago Flour, No. 1	3,705	3.20	3.05
No. 2	280	1.10	0.90
Flake Tapioca, Small	416	4.35	4.30
Medium	70	4.60	4.60
Pearl Tapioca, Small	500	4.40	4.30
Medium	685	4.15	4.15
Bullet	65	5.62½	4.80
Tin	3,275	81.62½	79.50

Export Telegram to Europe and America.

Fortnight ending 15th April, 1905.

Wired at 6 P.M. on 17th April, 1905.

					Tons.
Tin	Str.	Singapore & Penang to	United Kingdom &/or		1,990
Do.	,,	Do.	U. S. A.		177
Do.	,,	Do.	Continent		325
Gambier	,,	Singapore	Glasgow		...
Do.	,,	Do.	London		25
Do.	,,	Do.	Liverpool		50
Do.	,,	Do.	U. K. &/or Continent		270
Cube Gambier	,,	Do.	United Kingdom		40
Black Pepper	,,	Do.	Do.		55
Do.	,,	Penang	Do.		40
White Pepper	,,	Singapore	Do.		110
Do.	,,	Penang	Do.		...
Pearl Sago	,,	Singapore	Do.		35
Sago Flour	,,	Do.	London		225
Do.	,,	Do.	Liverpool		1,200
Do.	,,	Do.	Glasgow		250
Tapioca Flake	,,	Singapore & Penang	United Kingdom		225
T. Pearl & Bullets	,,	Do.	Do.		240
Tapioca Flour	,,	Penang	Do.		400
Gutta Percha	,,	Singapore	Do.		50
Buffalo Hides	,,	Do.	Do.		90
Pineapples	,,	Do.	Do.	cases	14,250
Gambier	,,	Do.	U. S. A.		375
Cube Gambier	,,	Do.	Do.		...
Black Pepper	,,	Do.	Do.		90
Do.	,,	Penang	Do.		...
White Pepper	,,	Singapore	Do.		25
Do.	,,	Penang	Do.		...
T. Flake & Pearl	,,	Singapore & Penang	Do.		10
Nutmegs	,,	Do.	Do.		...
Sago Flour	,,	Singapore	Do.		...
Pineapples	,,	Do.	Do.	cases	3,250
Do.	,,	Do.	Continent	,,	600
Gambier	,,	Do.	S. Continent		25
Do.	,,	Do.	N. Continent		125
Cube Gambier	,,	Do.	Continent		40
Black Pepper	,,	Do.	S. Continent		140
Do.	,,	Do.	N. Continent		45
Do.	,,	Penang	S. Continent		10
Do.	,,	Do.	N. Continent		...
White Pepper	,,	Singapore	S. Continent		20
Do.	,,	Do.	N. Continent		50
Do.	,,	Penang	S. Continent		...
Do.	,,	Do.	N. Continent		10
Copra	,,	Singapore & Penang	Marseilles		1,225
Do.	,,	Do.	Odessa		...
Do.	,,	Do.	Other S. Continent		280
Do.	,,	Do.	N. Continent		800
Sago Flour	,,	Do.	Continent		725
Tapioca Flake	,,	Singapore & Penang	Do.		90
Do. Pearl	,,	Do.	Do.		40
Copra	,,	Singapore	England		...

				Tons.
Gambier	Str.	Singapore	U. S. A.	...
Cube Gambier	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	...
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	...
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	...
Pineapples	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Nutmegs	,,	Do	Do.	...

850 tons Gambier } Contracts.
750 ,, Black Pepper }

Export Telegram to Europe and America.

Fortnight ending 30th April, 1905.

Wired at 4.30 P.M. on 1st May, 1905.

				Tons
Tin	Str.	Singapore and Penang to	United Kingdom &/or	1,186
Do.	,,	Do.	U. S. A.	575
Do.	,,	Do.	Continent	360
Gambier	,,	Singapore	Glasgow	...
Do.	,,	Do.	London	..
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	U. K. &/or Continent	150
Cube Gambier	,,	Do.	United Kingdom	5
Black Pepper	,,	Do.	Do.	55
Do.	,,	Penang	Do.	40
White Pepper	,,	Singapore.	Do.	70
Do.	,,	Penang	Do.	20
Pearl Sago	,,	Singapore	Do.	25
Sago Flour	,,	Do.	London	120
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	Glasgow	50
Tapioca Flake	,,	Singapore & Penang	United Kingdom	260
T. Pearl & Bullets	,,	Do.	Do.	100
Tapioca Flour	,,	Penang	Do.	100
Gutta Percha	,,	Singapore	Do.	85
Buffalo Hides	,,	Do.	Do.	55
Pineapples	,,	Do.	Do.	cases 9,000
Gambier	,,	Do.	U. S. A.	700
Cube Gambier	,,	Do.	Do.	110
Black Pepper	,,	Do.	Do.	400
Do.	,,	Penang	Do.	200
White Pepper	,,	Singapore	Do.	10
Do.	,,	Penang	Do.	...
T. Flake & Pearl	,,	Singapore & Penang	Do.	65
Nutmegs	,,	Do.	Do.	6
Sago Flour	,,	Singapore	Do.	125

					Tons.
Pineapples	Str.	Singapore	U. S. A.	cases	1,250
Do.	,,	Do.	Continent	,,	3,000
Gambier	,,	Do.	S. Continent		...
Do.	,,	Do.	N. Continent		325
Cube Gambier	,,	Do.	Continent		10
Black Pepper	,,	Do.	S. Continent		...
Do.	,,	Do.	N. Continent		310
Do.	,,	Penang	S. Continent		10
Do.	,,	Do.	N. Continent		...
White Pepper	,,	Singapore	S. Continent		35
Do.	,,	Do.	N. Continent		55
Do.	,,	Penang	S. Continent		...
Do.	,,	Do.	N. Continent		...
Copra	,,	Singapore & Penang	Marseilles		500
Do.	,,	Do.	Odessa		...
Do.	,,	Do.	Other South Continent		100
Do.	,,	Do.	N. Continent		1,700
Sago Flour	,,	Do.	Continent		430
Tapioca Flake	,,	Singapore & Penang	Do.		340
Do. Pearl	,,	Do.	Do.		225
Copra	,,	Singapore	England		...
Gambier	Str.	Do.	U. S. A.		...
Cube Gambier	,,	Do.	Do.		...
T. Flake and Pearl	,,	Do.	Do.		...
Sago Flour	,,	Do.	Do.		...
Gambier	,,	Do.	S. Continent		...
Copra	,,	Do.	Marseilles		...
Black Pepper	,,	Do.	S. Continent		...
White Pepper	,,	Do.	Do.		...
Do.	,,	Do.	U. S. A.		...
Pineapples	,,	Do.	Do.		...
Nutmegs	,,	Do.	Do.		...
Black Pepper	,,	Do.	Do.		...
Do.	,,	Penang	Do.		...
White Pepper	,	Do.	Do.		...
T. Flake & Pearl	,,	Do.	Do.		...
Nutmegs	,,	Do.	Do.		...

850 tons Gambier } Contracts.
600 ,, Black Pepper }

Singapore.

Abstract of Meteorological Readings for the month of April, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·917	142·9	81·0	90·1	74·8	15·3	78·3	·901	76·5	82	S.E.	9·31	2·12

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL,
Principal Civil Medical Officer, S.S.

Kandang Kerbau Hospital Observatory,
Singapore, 13th May, 1905.

Penang.

Abstract of Meteorological Readings in the Prison Observatory for April, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	°F	%		Ins.	Ins.
Criminal Prison Observatory	29·901	149·8	80·8	90·7	74·5	16·2	75·7	·796	70·81	70	N. W.	9·45	1·65

Colonial Surgeon's Office,
Penang, 8th May, 1905.

M. E. SCRIVEN,
Assistant Surgeon.

G. D. FREER,
For Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for the month of April, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Durian Daun Hospital	29·829	160·1	83·2	89·5	74·5	14·9	80·3	·998	71·7	87	E.	8·34	2·02

Colonial Surgeon's Office,
Malacca, 21st May, 1905.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of April, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping ...	...	154	82·17	92	72	20	78·12	909	...	83	...	19·13	1·92
Kuala Kangsar ...	...	...	81·39	94	71	23	76·41	843	...	78	...	7·96	2·75
Batu Gajah ...	...	162	81·91	93	71	22	77·72	894	...	83	...	12·36	2·69
Gopeng ...	...	...	80·75	93	62	31	76·45	854	...	82	...	8·37	2·51
Ipoh ...	...	...	81·93	94	71	23	77·80	898	...	83	...	7·31	1·22
Kampar ...	...	...	...	...	70	...	...	...	...	...	...	18·17	3·32
Teluk Anson ...	...	...	82·20	92	72	20	77·97	893	...	82	...	7·15	1·69
Tapah ...	...	...	81·90	94	69	25	77·02	864	...	80	...	9·22	1·45
Parit Buntar ...	...	...	82·73	91	63	28	77·79	886	...	79	...	7·43	1·65
Bagan Serai ...	...	...	83·01	91	70	21	78·10	896	...	79	...	9·01	1·82
Selama ...	...	...	82·43	91	72	19	78·40	918	...	83	...	22·02	4·15

State Surgeon's Office,
Taiping, 17th May, 1905.

M. J. WRIGHT,
State Surgeon.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for the month of March, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis ...	...	...	...	94·0	69·0	19·19	...	...	...	...	...	4·14	1·83
Raub ...	...	...	...	92·0	66 0	18·07	...	...	...	...	...	4·28	1·70
Bentong ...	...	...	...	93·0	68·5	18·03	...	...	...	...	...	3·69	1·75
Temerloh ...	...	...	...	94·0	70·0	17·67	...	...	...	...	...	2·38	·88
Pekan ...	...	...	...	93·0	70·0	13· 4	...	...	...	...	...	3·62	1·81
Kuala Kuantan ...	...	...	...	91·0	66·0	16· 7	...	...	...	...	...	1·82	·90
Sungei Lembing ...	...	...	...	89·0	63·5	25 ·5	...	...	...	...	...	4·05	2·01

Kuala Lipis,

25th April, 1905.

Muar.

Abstract of Meteorological Readings for the month of April, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Lanadron Estate ...	...	...	81°	91°	72°	19°	75°	...	...	...	...	9·79	2·48

Muar, 8th May, 1905.

ROGER PEARS.

The Duff Development Company, Limited, Kelantan.

Abstract of Meteorological Readings for the month of April, 1905.

DISTRICT.	Temperature.			Rainfall.	
	Mean Maximum.	Mean Minimum.	Mean Range.	Total Rainfall.	Greatest Rainfall during 24 hours.
	°F	°F	°F	Inches.	Inches.
Kuala Lebir ...	91·6	70·4	20·2	3·03	1·41
Kuala Kelantan ...	88·5	73·6	14·9	1·38	·74

Surgeon's Office,

May 9th, 1905.

JOHN D. GIMLETTE,

Surgeon.

METEOROLOGICAL OBSERVATIONS.

Table Showing the Daily Results of the Reading of Meteorological Observations taken at the General Hospital, Seremban, For the Month of March, 1905.

Date.	Temperature of radiation.						Temperature of radiation.				Wind.		Temperature of evaporation.			Computed vapour tension.			Relative humidity.			Clouds 0 to 10.			Cloud and weather initials.			Rain.
	9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Sun.	Difference sun and shade.	Grass.	Difference shade and radiation.	Direction. 9 H	15 H	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	21 H	9 H	15 H	21 H	Inches.
	°	°	°	°	°	°	°	°	°	°			°	°	°	in.	in.	in.	°	°	°							
1	77	86	81.5	89	72	17	167	78	...	...	S.E.	S.E.	73·6	72·8	73·2	0·829	0·808	0·818	89	64	76·5	0	3	10	B	C	R	.25
2	76	86	81	88	73	15	165	77	...	...	E.	S.E.	74·3	71·2	72·7	·848	·855	·851	94	68	81	3	0	0	C	B	B	
3	78	88	83	89	73	16	163	74	...	...	E.	N.E.	71·2	66·7	68·9	·765	·655	·710	79	49	64	0	0	0	B	B	B	
4	78	86	82	88	72	16	164	76	...	...	E.	E.	66·1	67·9	67·	·642	·681	·661	67	55	61	0	0	0	B	B	B	
5	82	87	84·5	89	69	20	164	75	...	...	E.	E.	67·	68·9	67·9	·662	·708	·685	60	55	57·5	0	0	0	B	B	B	
6	81	89	85	90	69	21	165	75	...	...	E.	N.E.	67·6	67·8	67·7	·675	·677	·676	64	49	56·5	0	0	0	B	B	B	
7	81	88	84·5	90	74	16	163	73	...	...	N.E.	N.E.	67·6	66·7	67·1	·675	·855	·765	64	49	56·5	0	0	0	B	B	B	
8	82	90	86	91	70	21	175	84	...	...	S.E.	N.E.	67·	68·8	67·9	·662	·704	·683	60	50	55	0	0	0	B	B	B	
9	79	89	84	90	70	20	167	77	...	...	N.E.	N.E.	68·9	66·2	67·5	·707	.640	·673	71	46	58·5	0	0	0	B	B	B	
10	82	88	85	89	72	17	160	71	...	...	E.	E.	68·6	66·7	67·6	·701	·855	·778	64	49	56·5	0	0	0	B	B	B	
11	84	88	86	90	71	19	165	75	...	...	E.	E.	67·4	66·7	67·	·671	·855	·763	57	49	53	0	0	0	B	B	B	
12	83	87	85	90	72	18	163	73	...	...	E.	S.E.	71·3	72·2	71·7	·766	.792	·779	68	61	64·5	0	0	0	B	B	B	
13	81	79	80	92	73	19	166	74	...	...	E.	E.	70·9	75·6	73·2	·757	·888	·822	72	90	81	0	10	5	B	10	C	
14	78	87	82·5	89	74	15	167	78	...	...	E.	S.	74·6	75·5	75·	·857	·884	·870	89	69	79	3	5	10	C	C	R	·70
15	77	87	82	89	72	17	160	71	...	...	E.	S E.	73·6	75·5	74·5	·829	·884	·856	89	69	79	0	0	0	B	B	B	·50
16	81	82	81·5	90	71	19	158	68	...	...	N.E.	S.W.	74·2	78·7	76·4	·849	·978	·913	80	90	85	0	10	10	B	R	R	.20
17	79	87	83	88	72	16	157	69	...	...	E.	N.E.	73·9	73·9	73·9	·839	·837	·838	85	65	75	0	0	0	B	B	B	.65
18	80	89	84·5	89	74	15	157	68	...	...	E.	N.E.	73·3	72·7	73·	·820	·801	·810	80	58	69	0	0	0	B	B	B	
19	80	88	84	90	74	16	157	67	...	...	N.E.	S.E.	73·3	74·9	74·1	·820	·865	·842	80	65	72·5	0	5	10	B	B	B	·70
20	81	89	85	90	74	16	155	65	...	...	S.E,	S.E.	74·2	76.	75·1	·849	·895	·872	80	65	72·5	0	0	0	B	B	B	
21	82	91	86·5	91	74	17	165	74	...	...	E.	E.	73·6	73·3	73·4	·830	·816	·823	76	56	66	0	5	5	B	C	C	
22	80	89	84·5	90	74	16	155	65	...	...	N.E.	E.	73·3	71·1	72·2	·820	·757	·788	80	55	67·5	0	0	5	B	B	C	
23	83	90	86·5	91	74	17	163	72	...	...	E.	E.	71·3	73·7	72·5	·766	·833	·799	68	59	63·5	0	0	0	B	B	B	
24	82	87	84·5	89	75	14	155	66	...	...	E.	E.	72·	72·2	72·1	·785	·792	·788	72	61	66·5	3	5	0	C	C	B	
25	79	88	83·5	89	73	16	137	48	...	...	S.E.	S.E.	73·9	74·9	74·4	·839	·865	·852	85	65	75	0	5	10	B	C	R	1.95
26	77	84	80·5	85	73	12	119	34	...	...	S.E.	S.E.	75·3	75·7	75·5	·877	·888	·882	94	76	85	3	5	10	C	C	R	1·60
27	79	84	81·5	89	73	16	120	31	...	...	N.E.	S.E.	75·6	74·	74 8	·888	·840	·864	90	72	81	0	3	10	C	C	R	,20
28	76	83	79·5	86	73	13	125	39	...	...	E.	E.	74·3	78·	76·1	·848	·956	·902	94	85	89·5	3	5	5	C	C	C	,83
29	76	85	80·5	90	75	15	132	42	...	...	S.E.	S.E.	74·3	75·	74·6	.848	.873	.860	94	72	83	5	5	5	C	C	C	
30	80	85	82·5	87	73	14	160	73	...	...	S.E.	S.E.	73·3	80·	76.6	.820	1.026	.923	80	85	82·5	5	10	5	C	R	C	10.
31	78	84	81	87	74	13	160	73	...	...	S.E.	S.E.	74·6	77·4	76·	.857	·938	.897	89	80	84·5	5	5	5	C	C	C	

Total 7·68

STATE SURGEON'S OFFICE,
Seremban, 6th April, 1905.

R. VAN GEYZEL,
Apothecary.

No. 5.] MAY, 1905. [VOL. IV.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY
H. N. RIDLEY, M. A., F. L. S.,
Director of Botanic Gardens, S. S.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

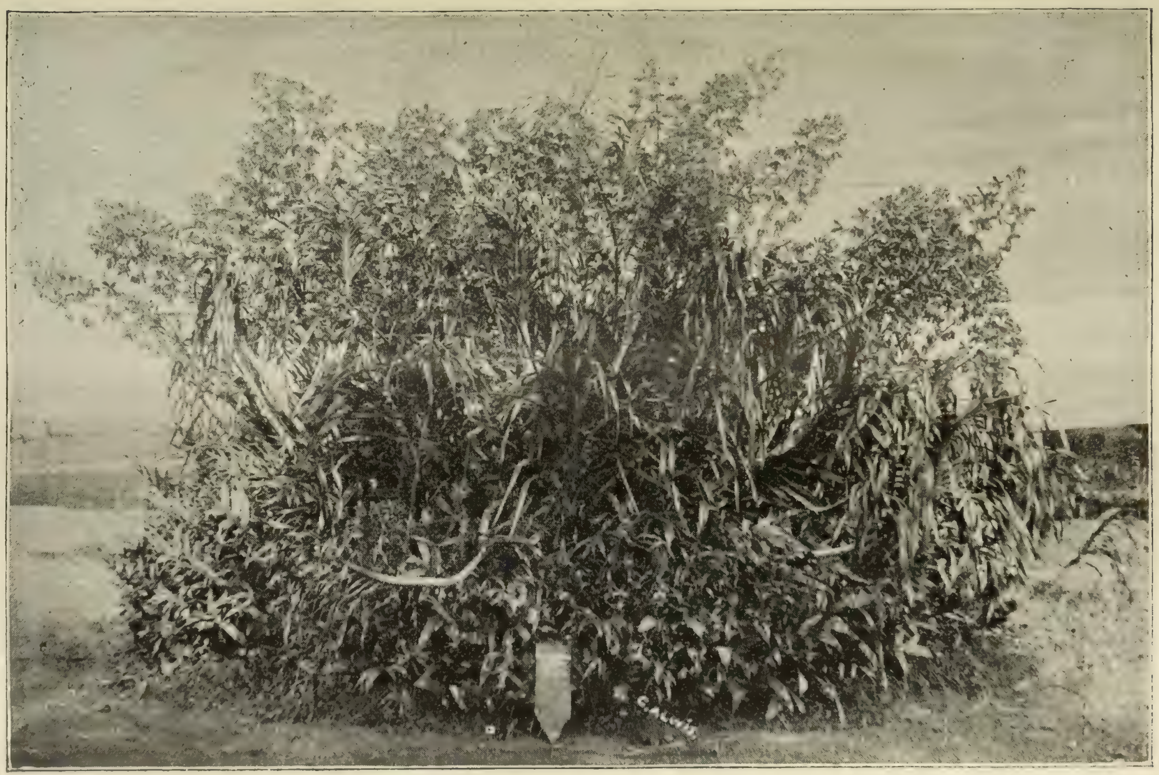
2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

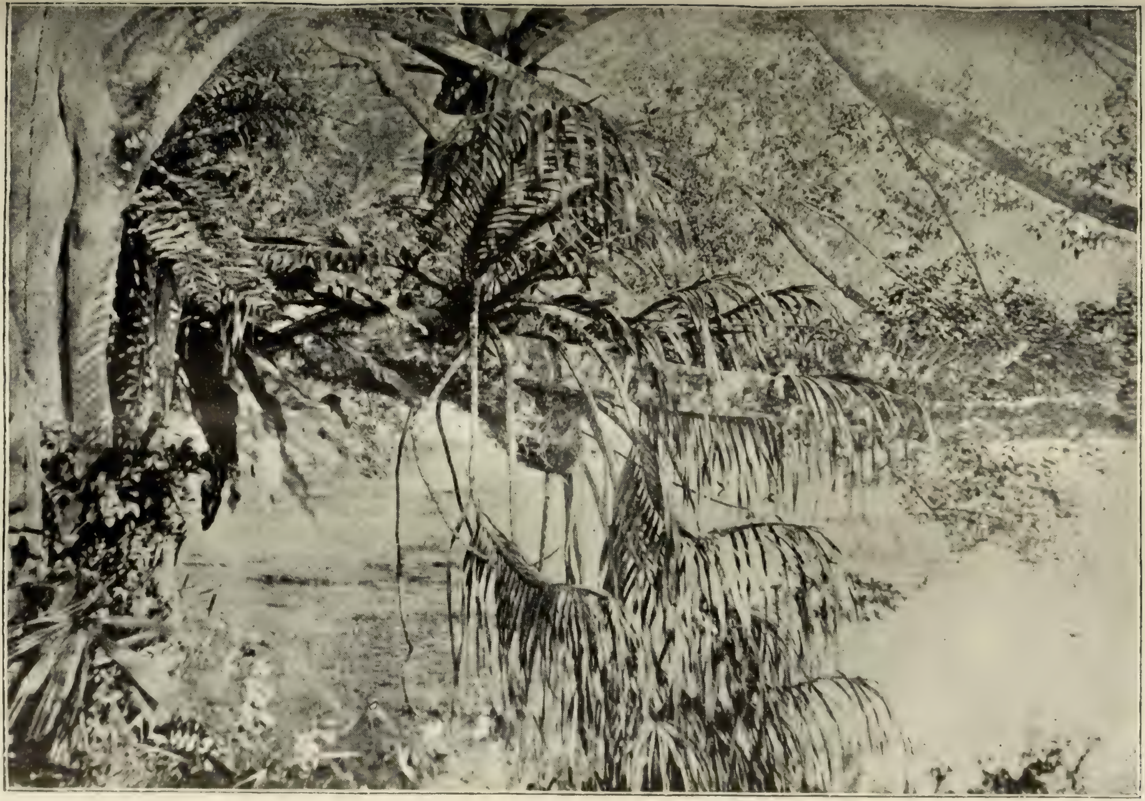
3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

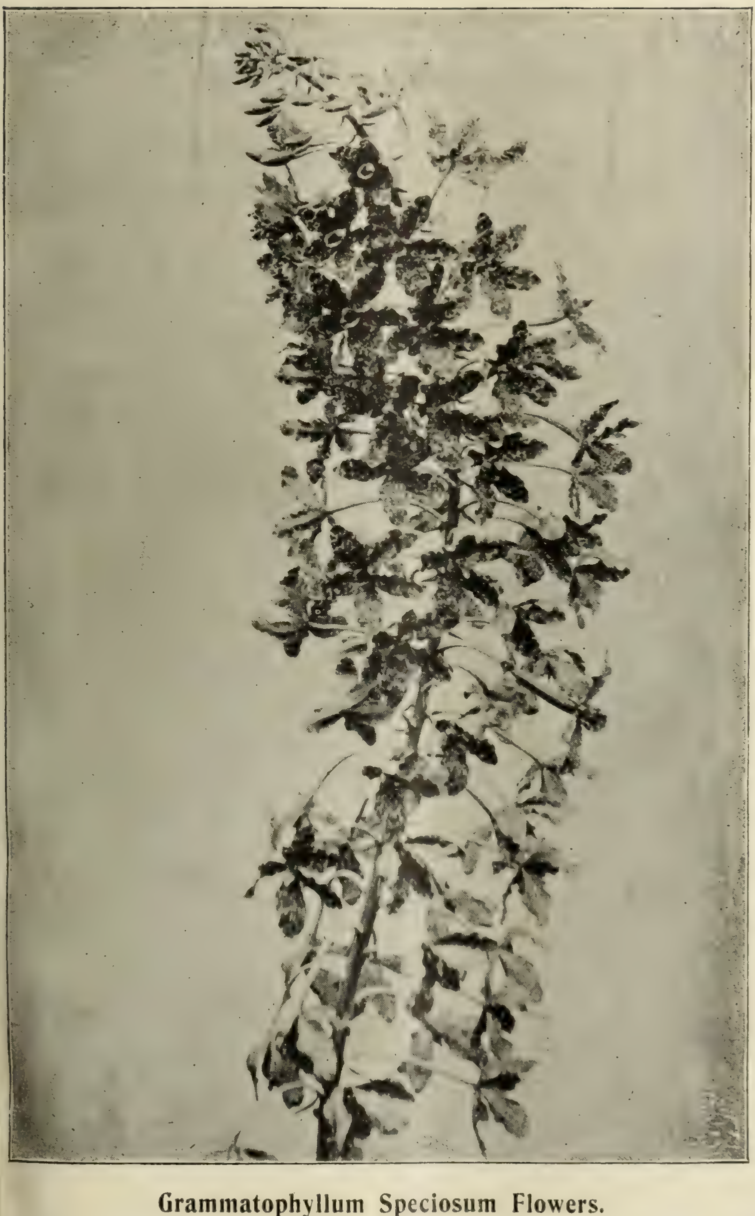
It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.



Grammatophyllum Terrestrial.



Grammatophyllum as an epiphyte.



Grammatophyllum Speciosum Flowers.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 5.] MAY, 1905. [VOL. IV.

GRAMMATOPHYLLUM SPECIOSUM.

PLATES I—III.

This superb orchid, so characteristic of the Malay region, is probably the largest species of the order in the world, though its flowers are by no means as large as many others. One of the biggest plants in the Botanic Gardens weighed three quarters of a ton when it was taken down from the tree on which it grew, at Malacca near Tanjong Kling. This plant was originally intended for the great Chicago Exhibition, but its immense size and weight made it so difficult to handle that it was much damaged in transit, and a smaller one was sent which eventually found its way into the Royal Gardens, Kew, where it recently commenced to flower.

The plant has a rather wide distribution ranging from Tenasserim through the Malay Peninsula to Borneo, Java, the Philippines and Solomon Islands, whence, lately, Mr. WOODFORD sent a drawing and some dried flowers. Properly speaking, it is epiphytic, growing on trees overhanging streams, or in mangrove swamps or high up on lofty trees in the forests; but, occasionally, when it falls from the tree it goes on growing on the ground. In cultivation, it is usually grown on the ground in a mound made of soil and broken bricks, etc., and in that case the stems become shorter and erect as shown in Plate I, and the plant is certainly more floriferous. When growing on a tree (Plate II), the stems become longer and gracefully decurved, attaining a length often of over ten feet; the flower spikes stand quite erect.

The plant emits from the base a large number of curious erect branched roots, and care should be taken not to allow these to be injured or cut away, or the plant will make but slow growth and will not flower. Big plants produce a vast number of stems especially if grown on the ground. These stems are six to ten feet long and as thick as the wrist deeply grooved, and oval in section.

After the flowering period, many of these stems shed their leaves and die, others springing up from the base. These dead stems must on no account be cut-off, however shabby they look, till they are quite shrunken, because they contain the food-supply for the next shoot; and if cut off before the starch has passed into the new growth, the development is arrested and the new shoot is starved. When the last year's stem is empty, it shrinks and dries up or rots away. The leaves of the plant are narrow and grassy, flaccid and decurved.

The flower spikes are produced in the end of August and September and grow with surprising rapidity from the base of the stems. They attain a height of about six to ten feet, and bear about 125 to 135 flowers each. The flowers open three or four at a time on each spike, so that the plant remains in flower for nearly two months. The five or six lowest ones at the base of the stem are always abnormal, possessing no lip and a rudimentary column, and consisting of two opposite pairs of petals. The normal flowers are three inches across, with the petals and sepals yellow, spotted with brown (whence its name of Leopard orchid). The lip is hairy and dull pink. There is not much variation in the colouring of the flowers, but in some forms (*e.g.*, the big one alluded to previously as brought from Malacca) the ground colour is a brighter yellow and the spots smaller and of a richer brown. This is the most beautiful form I have seen. The number of flower spikes produced on a strong plant is well shown in the Plate I. There were 64 in the plant figured and altogether produced about 8,000 flowers, but it has been even more floriferous than this. A figure of a portion of the spike is also given. Plate III.

The flowers are liable to the attacks of a yellow beetle, half an inch long, which also attacks *Arundina* and *Renanthera* flowers. Its grub is a slimy-looking thing which lives concealed in a white frothy mass which it excretes. It is easily found and destroyed, but if allowed to remain quite, spoils the blooming of these orchids in a very short time.

The flowers are fertilized by wasps or carpenter-bees, and about March ripen their fruits which are as large as a duck's egg. Not many are produced, however, the plant figured produced only 25 capsules this year in spite of the enormous number of flowers it produced.

Cultivation Notes.—The plant may be grown on the ground on a raised mound about a foot or more high of leaf mould broken bricks, tiles, etc., but care must be taken not to plant it too deep. The base should only be covered enough to hold the plant in place. The mound need not be kept absolutely free of weeds; it is even better if such ferns as will stand full sun, such as *Davallia elegans* and *Polypodium phymatodes*, are allowed to grow over the mound so as to shade the base. The plant does best in full sun. It may also be grown on an old stump to which it must be tied or in the fork of a tree. As it requires to be a good-sized plant before it flowers really well, it never seems to do well in a tub, and is best planted out. As has been mentioned, care must be taken to develop and not to injure the erect roots either by cutting them or throwing soil on them. When the plant is big enough to flower, it may be manured with a little cowdung and water one month before flowering, not later, *i.e.*, about the beginning of July. This is better than adding cowdung or manure thrown on the base, as that is liable to injure the erect roots.

During flowering the plant should be examined to destroy the grubs and beetles attacking the flowers. About March, the plant may be cleaned by removing the old withered stems, flower-stalks, etc.

Occasionally, the plant gets attacked by a fungus which appears as black spots on the leaves, and this sometimes attacks the young shoots destroying the bud. In this case, the fungus may prove very injurious to the plant. Spraying with Bordeaux mixture might stop its ravages.

The plant can be propagated by breaking it up when it is a large plant. Although it fruits constantly in the Gardens and its abundant seed is drifted about on the wind, I do not know of any young plants derived from the large ones in the Gardens.

H. N. RIDLEY.

Rubber Tapping in the Botanic Gardens, Singapore.—*Continued.*

Experiment VI (Morning).

GROUP OF 15 TREES.

Reg No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.		Dec.	*					1904.
953		3 9½	Herring-bone,	15	1¼					
960		3 10½	daily.	19	9¾					
961		3 8¾		26	9					
973		3 9¾		27	14¼					
980		3 10⅞		28	16					
983		3 10¾		29	16					
984		3 11		30	16¾					
996	I.	3 7½		31	15					
999		3 9		Jan.						1905.
1,001		3 8		1	16					
1,005		3 10⅛		3	15¾					
1,029		3 7½		4	13	22	246¼ ozs.	lbs. 1·0$\frac{6}{15}$	Under ½ ounce.	
1,031		3 8½		5	12¼		15$\frac{6\frac{1}{4}}{16}$ lbs.	ozs.		
1,034		3 8¾		6	7¾					
1,049		3 10⅞		7	13½					
	Aggregate Girth ...	56 9 †		8	12					
				9	10					
				10	8¼					
				11	9					
				12	9¾					
				13	7					
				14	7					
				15	7					

* Nearly dry rubber.

† Each tree between 3 feet 6 inches and 4 feet girth.

Experiment VI (Morning).

GROUP OF 15 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.		Dec.	*					
432	II.	3 9¾	Herring-bone, daily.	21	3					1904.
435		3 6¾		29	10½					
				Jan.						
436		3 7½		3	14					1905.
438		4 0		4	17					
443		3 10½		5	16½					
449		3 10¼		6	22					
456		3 7½		7	25					
459		3 9¼		8	23½					
462		3 10¼		9	18½					
465		3 11		10	20¼					
467		3 7¼		11	16					
469		3 8¼		12	18½	21	327¼ ozs. 20.7¼ lbs.	lbs. 1.5$\frac{12}{45}$ ozs.	Under ½ ounce.	
473		3 7½		13	14½					
477		3 10¼		14	17					
486		3 7		15	18¾					
	Aggregate Girth ...	56 3 †		16	15½					
				17	11½					
				18	11¾					
				19	12					
				20	9¾					
				21	11¾					

* Nearly dry rubber.

† Each tree between 3 feet 6 inches and 4 feet girth.

Experiment VI (Morning).

GROUP OF 15 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.		Dec.	*					1904.
59	III.	4 2	Herring-bone, daily.	20	2					
104		4 0½		28	12¼					
133		4 2		Jan.						1905.
154		4 2		3	17					
358		4 4½		4	17½					
366		4 5¼		5	15					
415		4 4½		6	15					
1,011		3 5⅞		7	21½					
945		3 8		8	16¾					
966		3 3¾		9	18¼					
429		4 5¾		10	15½					
431		4 4¼		11	16	21	ozs. 276¾	lb. $1 \cdot 2\frac{6\frac{3}{4}}{15}$	Under ½ ounce.	
433		4 6		12	14		lbs. $17\frac{4\frac{3}{4}}{16}$			
978		3 1¾		13	11½					
472		4 1½		14	8¾					
				15	14½					
				16	12¼					
				17	11½					
				18	11¼					
	Aggregate Girth ...	60 9½		19	9¼					
				20	9¼					
				21	7¾					

* Nearly dry rubber.

Experiment VI (Morning).

GROUP OF 15 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth. at 3 feet from Ground.	Remarks.
		Ft. in.		Dec.	*					
				30	2½					1904.
11		5 1		Jan.						
13		5 4	Herring-bone, every other day.	16	10					1905.
24		5 3		18	5½					
				20	13					
28		5 2		22	11¾					
38		5 0¼		24	17½					
61		5 1		26	21					
				28	21½					
74		5 6		30	23¾					
202	IV.	5 0½		Feb.		23	399 ozs.	1.10$\frac{9}{15}$ lbs.	Under ½ ounce.	
296		5 0½		1	26¼		24$\frac{5}{16}$ lbs.			
				3	22¼					
932		4 8⅛		5	26½					
935		4 8		7	20½					
947		4 7⅞		9	22¼					
				11	17½					
950		4 8¼		13	20½					
951		4 6¾		15	4 †					
957		4 9		17	22¼					
				19	22¼					
				21	19					
	Aggregate Girth ...	74 6¼		23	19½					
				25	15¼					
				27	14½					

* Nearly dry rubber. † Heavy Rain.

Experiment VI (Morning).

GROUP OF 15 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.		Dec.	*					1904.
				31	5¾					
7		7 3¾	Herring-bone, daily.	Jan.						1905.
416		5 7¾		16	7½					
				17	13½					
489		6 5¾		18	20¼					
629		5 8		19	25½					
654		5 9		20	25¼					
				21	27¼					
723		5 2		22	24					
776		5 1		23	22½					
815	V.	5 8¾		24	20¾					
830		6 4¼		25	23¼					
				26	29					
832		5 5		27	30	28	636¼ ozs.	lbs. 2	Over ½ ounce.	
				28	26½		33½ lbs.	$10\frac{6}{15}$ ozs.		
927		5 2¾		29	24					
941		5 4		30	29					
1182		5 1¾		31	29					
				Feb.						
1206		5 11¾		1	23½					
1210		5 3½		2	26½					
				3	25½					
				4	26¾					
	Aggregate Girth ...	85 7		5	25					
				6	17¼					
				7	21½					
				8	21¾					
				9	22½					
				10	18¾					
				11	24¼					

* Nearly dry rubber.

Experiment VI (Evening).

GROUP OF 15 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.		Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
					Dec.	*					
		Ft.	in.		15	¾					1904.
					19	7					
1,057		3	10¼	Herring-bone, daily.	26	8¼					
1,077		3	6⅛		27	12¼					
1,111		3	8½		28	12¾					
1,152		3	9½		29	11½					
1,154		3	8½		30	14½					
1,157		3	6¾		31	14¼					
					Jan.						
1,172		3	9½								1905.
1,180	I.	3	10⅜		1	14					
1,183		3	7⅞		3	13					
1,184		3	9¾		4	8½					
					5	11¼					
1,190		3	10¼		6	10½	22	ozs. 206¾ =lbs. $12\frac{14\frac{3}{4}}{16}$	ozs. $13\frac{11}{15}$	Over ¼ ounce.	
1,191		3	10⅛		7	9¼					
					8	8½					
1,083		3	6		9	11¼					
975		3	0		10	7					
976		3	4½		11	8					
					12	7					
	Aggregate Girth ...	57	10		13	7					
					14	6½					
					15	3¾					

* Nearly dry rubber.

Experiment VI (Evening).

GROUP OF 15 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Groun l.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.		Dec.	*					1904.
487		3 8½	Herring-bone, daily.	21	2½					
490		3 6¾		29	5					
491		3 10½		Jan.						1905.
886		3 6½								
895		3 6¼		3	15					
				4	12					
903		3 7¾		5	15¼					
909		3 6¾		6	16¼					
931	II.	3 8½		7	15½					
				8	15¼					
933		3 11½		9	17½					
937		3 11½		10	16	21	261½ ozs.	$1.1\frac{6\frac{1}{2}}{15}$	Under ½ ou ce.	
939		3 8		11	15¾		$16\frac{15\frac{1}{2}}{16}$ lbs.	ozs.		
				12	13					
940		3 10		13	15					
948		3 9⅝		14	14					
949		3 6¼		15	9					
				16	12½					
952		3 10½		17	11					
				18	10					
				19	10¾					
	Aggregate Girth ...	55 8¾		20	10½					
				21	9¾					

* Nearly dry rubber.

Experiment VI (Evening).

GROUP OF 15 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground. Ft.	in.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
					Dec.	*					1904.
					20	3½					
				Herring-bone, daily.	28	12					
982		3	5¼		Jan.						1905.
1,035		4	1		3	13¾					
1,041		4	0¼		4	17¼					
1,064		4	2¾		5	15¾					
1,100		4	6⅜		6	14					
1,125		4	2		7	19¼					
1,128		4	2⅞		8	15					
					9	14¼					
1,170	III.	4	0¼		10	18¼	21	ozs. 271 = lbs. 16$\frac{15}{16}$	lbs. 1.2$\frac{1}{16}$	Over ¼ ounce.	
1,176		4	10		11	16½					
1,179		4	5		12	12¾					
1,186		4	9¼		13	14½					
1,194		4	4½		14	14½					
1,204		4	7		15	12½					
1,209		4	8¾		16	14					
1,212		4	2⅛		17	10					
					18	6½					
	Aggregate Girth ...	64	7¼		19	12					
					20	7					
					21	7¾					

* Nearly dry rubber.

Experiment VI (Evening).

GROUP OF 15 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
				Dec.	*					
		Ft. in.		30	12					1904.
				Jan.						1905.
354	IV.	5 3¼	Herring-bone, every other day.	16	5¾	23	404½ ozs. = $25\frac{4\frac{1}{2}}{16}$ lbs.	1 lb. 11 ozs.	Under ½ ounce.	
359		5 4½		18	10½					
439		5 5¼		20	16½					
461		5 4		22	19½					
463		5 1½		24	21¾					
610		5 4⅛		26	23½					
690		5 1½		28	24¼					
691		5 5½		30	24¼					
				Feb.						
990		3 5⅜		1	20½					
1,013		3 5		3	23¾					
1,025		3 4¾		5	21					
871		4 6¾		7	22½					
921		4 9½		9	22¾					
925		4 9½		11	22					
929		5 0		13	23½					
				15	3¾					Rain.
	Aggregate Girth ...	71 10½		17	12¼					
				19	12					
				21	13½					
				23	16¼					
				25	19¼					
				27	13½					

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* Nearly dry rubber.

Experiment VI (Evening).

GROUP OF 15 TREES.

Reg. No. of Tree.	Working Number.	Registered Girth at 3 feet from Ground.	Mode of Incision.	Date.	Amount. Ounces.	Times Tapped.	Total Yield.	Average Yield per Tree.	Comparative Yield per inch of Girth at 3 feet from Ground.	Remarks.
		Ft. in.		Dec.	*					
				31	4½					1904.
				Jan.						
1		6 1	Herring-bone, daily.	16	4½					1905.
425		5 6½		17	8¼					
				18	12¾					
544		6 4½		19	15¼					
635		5 10¼		20	15½					
693		5 9½		21	17½					
				22	14¾					
709		5 1⅝		23	15½					
744		5 1		24	18¾					
826	V.	5 2½		25	18¼					
				26	19¼					
827		5 9½		27	17¾	28	433¼ ozs. $27\frac{1\frac{3}{4}}{16}$ lbs.	$1.12\frac{13}{15}$ ozs.	Under ½ ounce.	
912		5 2		28	18¾					
1,037		3 1⅛		29	18¾					
1,097		5 3⅜		30	17¾					
				31	14¼					
				Feb.						
1,144		6 1¾		1	17¾					
1,201		5 1¼		2	17½					
1,211		5 5¾		3	15½					
				4	17					
	Aggregate Girth ...	81 1½		5	17					
				6	18½					
				7	17					
				8	16					
				9	16					
				10	15					
				11	14½					

* Nearly dry rubber.

Experiment VI.

MORNING.						EVENING.					
Working Number.	Aggregate Girth.	Mode of Incision.	Times Tapped.	Rubber obtained.		Working Number.	Aggregate Girth.	Mode of Incision.	Times Tapped.	Rubber obtained.	
	Ft. in.			lbs.	ozs.					lbs.	oz.
I.	56 9	H. B. daily.	22	15	6¼	I	57 10	H. B. daily.	22	12	14
II.	56 3	H. B. daily.	21	20	7¼	II	55 8¾	H. B. daily.	21	16	15½
III.	60 9½	H. B. daily.	21	17	4¾	III	64 7¼	H. B. daily.	21	16	15
V.	85 7	H. B. daily.	28	33	8	V	81 1½	H. B. daily.	28	27	1¾
IV.	74 6	H. B. every other day.	23	24	5	IV	71 10½	H. B. every other day.	23	25	4¼
	333 10½	Total.		110	15¼		331 2	Total.		99	2½
				99	2½						
				11	12¾	In favour of morning over evening tapping.					

H. B.=Herring-Bone.

THE PUPOI.

Connaropsis Griffithii.

A large bag of fruit of the Pupoi (*Connaropsis Griffithii*) was sent to the Gardens from Johore by Rajah HITAM, and as I find that very little seems to be known about this fruit-tree, I give a description of it. The tree is about 40 to 60 feet tall, with reddish fairly durable wood. Leaves in threes, lanceolate, accuminate, 2½ to 4 inches long, ¾ to 1¼ wide, smooth dark green above, paler beneath, petiole ¼ inch long, slightly thickened. (Sir GEORGE KING describes the leaves as trifoliolate, but I should rather consider the leaflets as distinct leaves). The panicles of flowers are short, about 2 inches long or less, and red tomentose. Flowers shortly pedicelled, calyx cup shaped with ovate rounded lobes barely ⅛ inch long, pubescent petals twice as long, spathulate obtuse (red), filaments slender.

Fruit, ovate obtuse, an inch long, and nearly as much in diameter light green, smooth shining, containing one seed oval and flat like an apple pip. A great many of the fruit contained no seed at all. The fruit is rather firm in texture and acid. Stewed with plenty of sugar, it is very palatable tasting something like B'limbings, pleasantly acid. The Malays call it Kupoi or Pupoi, and use the fruit in the form of preserves or in curry. It appears to be most abundant in Malacca.

Editor.

FIBRES (*Continued*).

Bast Fibres.—The plants producing fibre of more or less value in their bark, the bast fibre plants, are very numerous, but most of them do not lend themselves to cultivation, either being too slow growing or producing too little. The best known are jute, *Corchorus capsularis*, and Ramie, *Bochmeria nivea*. The first of these is not at all suited for the wet Malay region. It occasionally occurs as a weed, but soon disappears again and never seems to attain the size required for successful cultivation. There are two other species which occur on our coasts in sandy or rocky places, but they have stems and branches too short to be of any value for cultivation.

Ramie.—It is unnecessary to do more than refer to here, as accounts of its cultivation and working have been several times published in our journal.

The bast fibre plants are best grouped according to the size of the plants as the treatment required for extraction of the fibre differs according as whether they are half herbaceous and the stems can be cut and beaten out or retted in water, or whether they are large trees or climbers and the bark has to be stripped off first before treatment.

The subherbaceous kinds met with here are chiefly *Malvaceous* or *Sterculiaceous* or *Tiliaceous* weeds.

The following list of those met with in the Peninsula includes all the plants which I can find recorded to have been anywhere used or experimented with as fibre plants, to which I have added a few which are locally used for tying or binding in any way.

Abutilon indicum, L. (*Malvaceæ*).
Hebiscus sabdariffa, L. ,,
H. abelmoschus ,,
H. esculentus
H. surattensis.
Urena lobata.
Abroma augusta Sterculiaceæ.
Triumfetta rhomboidea, (*Tiliaceæ*).
Abrus precatorius, (*Legummosæ*).
Pæderia fœtida, L. (*Rubiaceæ*).
Pachyrhizus angulatus (*Legummoæ*).
Gleichenia linearis (*Fern*).
Nepeuthes, spp.

Of woody climbers of which the bark has to be stripped off before treatment we have wild or cultivated

Anodeudron paniculata.
Cryptostegia grandiflora.
Artabotrys spp.
Gnetum spp.

Of trees or shrubs of which the bark requires to be stripped.

Ficus chartacea.
Alchornea villosa.
Anona muricata.
Artocarpus kunstleri, Terap.
A. incisa, Bread fruit.
Bixa arnoto, L.
Commersonia echinata.
Macaranga javanica.
Cordia myxa.
Hibiscus tiliaceus.
H. elatus, Cuba bast.
H. macrophylla, Tutok.
H. rosa sinensis.
Melochia arborea.
Thespesia populnea.
Wikstroemia indica.

Abutilon Indicum, L. (*Malvaceæ*).

A small shrubby plant about 6 feet tall or less, with orange yellow flowers usually to be found in waste ground; native names, Kambong Lobo, Bunga Kisar and Malbar.

The fibre is said to be good and suitable for cordage. The allied species, *A. Avicennæ*, is said to have a fibre superior to Indian jute and finer than Manilla hemp, and attempts were made to cultivate it in America; but though it was found to give so valuable a fibre it seems to have been abandoned for lack of a suitable fibre machine. The fibre is known as Indian mallow or American or Chinese jute as it is largely made in China also. The fibre seems to be prepared usually by simple retting and washing in water. *Abutilon indicum*, could be treated in this way also. It is a rapid grower and of short life. The plant, however, is not very abundant here and does not seem to establish itself very well.

Hibiscus sabdariffa (*Malvaceæ*).

The Rosella is not rarely cultivated in villages and especially by Tamils, but much more seldom to be met with than it should be, or indeed is in India and Australia for its fleshy acid calyces which are used for pies, jellies, etc. It is raised from seed and grows here usually to about 6 feet, but in other parts of the world in good soil 8 to 10 feet. It will grow on poor soil, but does better on richer ground. Being practically an annual, it grows fast, and can be taken up altogether when full grown. The fibre is obtained by retting when the plant is in flower. The fibre is said to be equal or superior to jute and fine and silky.

Hibiscus Abelmoschus, L. (*Kapas Hantu*).

Kapas Hantu, the musk seed, is more frequently to be found in waste ground than *H. sabdariffa*, and is more or less cultivated for its musk scented seed. It is a tall herb, about 6 feet tall, with palmate leaves, and conical hairy pods, the flowers large yellow with a maroon eye. It has been experimented with in India and gave a good return of fibre, 800 lbs. to the acre, but the Agricultural Horticultural Society of India came to the conclusion that it was not better than jute.

It can hardly be said to be cultivated in the Malay Peninsula, but a few plants occur in the Gardens here and there and the seeds are collected and sold at 75 cents a catty for use medicinally. The Malays do not seem to do anything with the fibre.

Hibiscus esculentus, Okra, Ladys' Fingers, Kachang Bendi, Kachang Lindir.

This well known vegetable is cultivated everywhere, and needs no description. Some years ago, in India and America, attempts were made to cultivate it for its fibre to replace jute. It, however, proved to be very inferior and on comparison with other mallow fibres was found to be about the poorest of those tried. The fibre is white pliant and lustrous, but brittle. It is, therefore, hardly worth trying when the other mallows which give a better fibre are as easy to cultivate.

H. Surattensis, L.

Asam Susor is a common scrambling prickly plant in hedges and waste ground, with handsome but fugacious flowers, yellow with a large purple-brown centre. It has been experimented on as a fibre plant, but no information as to the quality of its fibre is to hand.

Urena lobata (*Malvaceæ*).

The Perpulut of the Malays, also called Pulut-pulut, Pepulut and Poko Kelulut, is a very common weed in dry sandy places all over the tropics. It is generally 3 or 4 feet tall, with lobed leaves and rose pink flowers. The fruit consists of small adhesive burrs. The chief use of the plant here is for adulterating patchouli leaves, those of the Perpulut bearing some resemblance to the patchouli leaves. The fibre is said to be very fine, white, and a metre in length and to take colour well. It is very strong and makes good cordage. It has been experimented with also as a paper stuff and was found to be almost twice as strong as Bank of England note pulp. It does not seem, however, that it ever has been put under cultivation and it is doubtful if it would pay if it was.

Abroma augusta (*Sterculiaceæ*).

A shrub about 6 feet tall with lobed or entire leaves, dull purple hanging flowers, and large spreading capsules covered inside with irritating hairs. It is not uncommon about the limestone rocks in Selangor, Pahang, Perak, and sometimes occurring in waste ground. It is not, however, a plant which establishes itself very readily, though it is easy to grow it from seed. It is said to be cultivated in India. The fibre is obtained from the bark of the twigs, and the plant gives in India three crops a year. The fibre is very good and strong and it is suggested that it might be used for silk. It is much stronger than sunnhemp.

The fibre, however, seems to have been quite neglected even in India, where it is abundant, and I do not think the plant is known to the Malays. I do not know any native name for it, nor have I ever heard of its having been put to any use.

Triumfetta rhomboidea (*Tiliaceæ.*)

A very common slender shrubby weed with small yellow flowers, common in dry places in villages, coco-nut estates, etc. The Malays call it Champadang. The fibre is said to be used in Madras and is soft and glossy. It is allied to the jute plant, and if it could be cultivated readily it might be worked in the same way. It does not seem to be utilised here.

Abrus precatorius L. (*Leguminosæ*).

The well known climbing vetch with scarlet and black seeds, known as crab's eyes, common on our shores, and *Vigua Katjang*, the Kachang Perut Ayam, commonly cultivated for the beans, have both been utilized for fibre. The latter, in America, where it is largely grown for food, gave a good binding twine, and it was suggested by Dr. MASON that the limes should be utilized as well. It was doubtful, however, as to whether it could be extracted so as to pay commercially as it would be more troublesome to extract and work as it is not a straight fibre like hemp.

Poederia foetida (*Rubiaceæ*).

A climbing plant with lavender-colored flowers, very common in India but less so here. The cut stems are barked, twisted and the fibre pulled away. The plant is a perennial and the stems can be cut down when it will shoot up again. The fibre is strong, flexible, and silky. It does not seem, however, to have ever been much used, and some machinery would have to be invented for it.

Pachyrizas angulatus

The yam-bean, "Bengkuang" of the Malays, often cultivated in the Straits also produces a fibre from its turning stems. It is tough and used for fishing nets in Fiji.

Gleichenia linearis.

The common Resam fern produces also a fibre extracted by the Malays with a considerable amount of labour for ornamental binding of handles of weapons and the like. It is never likely to be of commercial value.

Nepenthes.

Several species of pitcher plants common in the Peninsula have strong tough stems used chiefly for binding hedges and the like.

GERMINATING PARA RUBBER SEEDS.

The following notes on germinating Para rubber seed is taken from the proceedings of the Agri-Horticultural Society of Madras October to December, 1904, p. 138 :—"In these gardens, we have been in the habit, for the last 3 years, of germinating seeds to supply to the planters on the Nilgiris. The first year, the plan of sowing direct in pots and pans was adopted with very poor results. In the second and third years, a system on the plan of a seed-tester was tried. Platforms were erected, about 4 feet from the ground, and on these old sacking was stretched (coir matting would be preferable). Over these was placed a little powdered charcoal to assist in retaining moisture. The seeds were then placed on this and covered with more sacking and the whole kept damp by occasional watering. The seeds were examined every day and as soon as any showed signs of germinating they were removed and potted off. Seventy-five per cent. of a case of seeds received from Peradeniya germinated after this treatment in spite of having been delayed by the Madras Customs authorities for over 3 weeks."

This plan might be well worth trying in cases where seeds have been long delayed in transit to the estate.

Editor.

NOTE ON TERMES GESTROI.

In the Annual Report of the Botanic Gardens for 1878, I find that Mr. MURTON reports "The white ants have caused the death of some fine specimens of coniferæ for which class they seem to have a great predilection. A large specimen of *Dammara Orientalis*, one of *Arancaria Bidwill*, one of *A. Cooki* and one of *Dacrydium Horsfieldi*, have fallen preys to their ravages. All attempts to arrest their progress by applications of kerosene and gastar in quantities not sufficient to kill the trees, proved useless; moreover, the roots and all the vital action of the plant is quite destroyed below the surface before any signs of failing or decay is betrayed in the branches and foliage."

There can be little doubt that this termite was *T. gestroi*, which was attacking the conifers as it does the rubber. The insect, however, seems to have quite disappeared shortly afterwards, as it is hardly alluded to again. The Gardens had not long been founded, and had apparently been somewhat neglected till 1875, when Mr. MURTON took charge. Under improved cultivation, the termite seems to have soon disappeared, as it will doubtless do in the same way in the rubber estates. It has quite disappeared from the Botanic Gardens now, except an occasional nest in the Gardens' jungle.

Editor.

NOTES ON SOME SAMPLES OF RUBBER.

We have recently received a small series of samples of rubbers as sold in England, from M. POBLOTH, and some notes on the appearances of these may be interesting.

Fine Para smoked. The best rubber imported. This is a dense firm rubber, the outside black, inside it appears of layers of different shades from a light smoky brown to darker brown and black. It has evidently been prepared by the Amazon's method so often described, and has the peculiar smoky smell that one is accustomed to in prepared rubber. Except for the smoky odour and the different colored layers, it appears very similar to the unsmoked rubber formerly made in the Gardens

Para entre fine showing alternate layers of smoked and virgin. The smoked layers resemble the dark ones of the previous rubber, but contain some spaces, apparently water bubbles, which are much more abundant in the pale colored virgin rubber, of which more than half the piece consists. This has a fish-like odour, and its appearance suggests that it contains still a good deal of water.

Both of these are apparently free of extraneous matter.

West India ball in sausages, probably smoked, ranks next to Para in quality. This is a black, rather sticky, rubber apparently made into rolls of bits coated with layers. It is full of bits of bark and dirt. The texture is firm and strong.

West Indian sheet is similar, but very irregular, more like masses of scrap joined together by dipping in latex. It is full of holes and bits of bark. These rubbers are castilloa elastica Peruvian sheet equal in quality to best West Indian is somewhat similar in colour, full of holes but with less dirt. It is sticky and has a rather unpleasant smell. This is apparently Castilloa elastica rubber.

Congo 1, from upper Congo, loses 7 per cent. less water in drying than fine Para, but is worth only 3/9 as against Para at 5/ The piece is made up of irregular bits stuck together. The bits are clean, but there is a certain amount of earth, etc., adhering to them and between the pieces. The rubber is black, firm and sticky.

Congo 2, from upper Congo, known as Red Marsai consists of irregular bits and layers pressed together, reddish grey with a good deal of red bark mixed in. It has a faintly smoky smell, but does not appear to have been smoked.

Congo bale, the commonest kind, inferior to the last two, from the Lower Congo, seems to be a mixture of at least two kinds; a red or grey kind and a black one, apparently made in bits and layers, full of spaces with a certain amount of bark and dirt. The darker parts look a very fair rubber, but the red is poor.

The Congo rubbers are probably all the produce of mixed Landolphias.

Benguela Nigger, inferior, mixed with bark, loses in washing nearly 50 per cent. This rubber is black, but so mixed with red bark that the pieces appear to be quite red. It is for the dirtiest rubber of the lot and looks more like bark dust stuck together with rubber than anything else. The produce of Landolphias, L. *owariensis*, L. *florida*, *Petersianus* and *parviflora* *Mozambique* spools coagulated on sticks. This is a light reddish grey rubber in short blunt cylinders 2 or 3 inches long. It has evidently been drawn out from the tree in the form of threads wound round sticks. It contains a little dirt, but not much, except the remains of the sticks on which it was rolled. These are the produce of *Landolphias Kirkii*, L. *Petersianus and* L. *florida*.

THE AGRICULTURAL SHOW, 1905.

The Hon: General Secretary writes from Penang:—The arrangements in connection with the forthcoming Show are well in hand. The various sub-Committees have finished revising the Prize List, and it is expected that it will be in the Printer's hands in a few days. Subscriptions are coming in very well, some $3,000 have already been subscribed. It is estimated that the Show will cost close on $10,000. It is hoped that the Standing Committee, and especially the District Officers, will take steps to inform the Natives, and get them to take an interest in the Show. They should be impressed with the necessity of preparing their Exhibits now by good cultivation of their crops, and by the manufacture of articles of native industry. Although there are a few alterations in the Prize List, in the main it is similar to that of last year. It is expected that with the very liberal prizes offered for padi, *viz.*, $50, $25 and $10, a record entry will result. Mr. A. HUTTENBACH has kindly promised a silver cup for the best collection of rice. His Excellency the Governor, has also been pleased to offer a cup for the best general Exhibit in the division for agricultural products. Altogether no pains are being spared to make the Show a success. It only remains for the Standing Committee to do their best to try and get the natives to take a real interest in their Exhibits. It might be mentioned that the Federated Malay States Government have again been good enough to carry Exhibitors and their Exhibits free of charge by the issue of third class fares. The Straits Steamship Co. have also kindly consented to allow a rebate of 25 per cent. off their usual freight on all *bona fide* Exhibits.

It might be added with advantage that Planters and others who have made field notes, on subjects of agricultural interest during the past year, would do well to put them in the form of a small paper, to be read on one of the days of the Show. The opportunity afforded by such a representative gathering of Agriculturalists for the discussion of such subjects should be taken advantage of. We shall lack the able services of Mr. P. J. BURGESS, but we could discuss the cultural if not the chemical side of Agriculture. Specimens of any insect or fungoid pests, that have been noticed, would be very interesting, together with any data with reference to them.

Records of growth of the same species on different soils, and in different aspects, shewing the different yield of the crop (if any) would be among the many suitable subjects for discussion. The above considerations, however, lead up to what is advocated in another paper, *viz.*, that the time is ripe for the formation of an Agricultural Society of the Straits and Federated Malay States.

A PROPOSAL FOR THE FORMATION OF AN AGRICULTURAL SOCIETY FOR THE MALAY PENINSULA.

The Superintendent of the Botanic Gardens at Penang writes that in discussing the designs and inscription for a permanent Medal and Diploma for the forthcoming and subsequent Agricultural Shows, he was struck by the want of some adequate inscription for the medals and diplomas, to designate what shows the medals represented and this leads him to suggest the formation of an Agricultural Society for the whole of the Malay Peninsula.

There can be no doubt that the immense strides of agriculture, of late, he writes, stimulated by the extraordinary success of rubber cultivation, will render imperative the formation of an Agricultural Society and no better opportunity could be found than the occasion of the forthcoming Show to be held in Penang in August, when the Standing Committee and Representatives of Agriculture from all parts of Malaya will meet in Penang. The formation of such a Society would justify the Committee of the Show in having the medals and diplomas struck with the inscription "The Agri-Horticultural Society's Show of the Straits Settlements and Federated Malay States, etc." This title, however, seems to be unnecessarily long-winded and as it is in every way more convenient to form titles of Societies as short as possible, it would be better to call it the "Agri-Horticultural Show of the Malay Peninsula," or "of Malaya."

Perhaps it might be considered somewhat premature to suggest the name of the society before the matter has been discussed, and before the arrival of the Director of Agriculture for the Federated Malay States, and the formation of his department; but it is desirable that all those interested in the agriculture of the Malay Peninsula should have an opportunity of considering the idea before the Show is held.

CORRESPONDENCE.

LAPORTEA CRENULATA,
KUALA KANGSAR, PERAK,
CAMP, PLUS RIVER,
26th March, 1905.

Dear Sir,—It may not be well known, and may interest readers of the *Agricultural Bulletin* to know there is a tree in the Malay States which stings, by name Jelatang (*Laportea crenulata*) the tree nettle, which grows to a height of about twenty feet. The leaf, which stings only, is about eight inches long, three inches broad, bark of tree smooth and of greyish colour. There are two specimens close to where I am camping, and by accident this morning I happened to touch two or three leaves of a young tree with my foot (I had slippers on only) and in consequence am badly stung. The symptoms are a burning sensation, similar to a nettle sting, no marks of any kind, and the part sweating every few seconds. The sting usually lasts for 3 days or longer.

Yours truly,
HAROLD FURNIVALL.

[*Laportea crenulata* is not very uncommon in the Peninsula, generally growing in rocky places. It is common too in many of the Malay Islands, and also in Christmas Island. Pulau Tioman, off the Pahang coast, is quite famous for it. Its powers of stinging vary very much apparently. In some trees, the stinging hairs really hurt but little, in others, the pain is severe and lasts a long time. The local remedy is to apply chunam, or any powdery form of lime. I was often stung by it in Christmas Island, (where besides this plant grow another species of *Laportea, Boehmeria platyphylla,* and a *Fleurya* all stinging plants) and never found the sting much worse than an English nettle. The application of water to the sting, it may be noted, always makes it worse.

Editor.

MISCELLANEOUS.

NOTICES TO SUBSCRIBERS.

1. For the information of subscribers and others who wish to complete their series of Bulletins, notice is given that numbers 1, 7, 8 and 9, of the old Series (1891 to 1900) and Nos. 1, 8, 9 and 10, of New Series, Vol. I (1901-1902) have been reprinted and copies can be had by all whose subscriptions are paid up to date. The cost to others is 50 cents a number.

2. A very large number of subscriptions, even for last year, are yet unpaid although subscribers have received more than one notice of the delay in payment. As this entails a good deal of extra work on the staff, subscribers are asked to send in their subscriptions without delay. Attention is called to the rule that all subscriptions should be prepaid.

3. Subscribers changing their addresses are requested to give notice to the Editor.

4. Subscribers outside the Peninsula will in future be charged $3.50 per annum instead of $3 to cover postage.

Meteorological observers are asked to send in their returns to arrive before the 10th day of the following month, if possible, so as to be in time for going to press.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of April, 1905.

District	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·887	147·5	80·8	91·3	71·8	19·5	76·3	0·819	73·5	79	Calm.	10·19	1·95
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	9·68	1·68
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	11·23	3·30
,, Klang	...	...	...	88·2	71·1	17·1	...	...	...	...	...	10·92	3·75
,, Kuala Langat	...	...	...	88·1	74·0	14·1	...	...	...	...	...	6·31	1·05
,, Kajang	...	...	...	93·6	73·3	20·3	...	...	...	...	...	12·16	1·47
,, Kuala Selangor	...	...	...	88·1	75·8	12·3	...	...	...	...	...	5·14	0·70
,, Kuala Kubu	...	...	...	92·6	72·4	20·2	...	...	...	...	...	11·17	2·28
,, Serendah	...	...	...	91·2	76.2	15·0	...	...	...	...	...	7·69	1·14
,, Rawang	...	...	...	87·0	...	...	...	...	...	...	...	7·55	2·30
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	7·02	2·04
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	...	5·14	1·54

State Surgeon's Office,

Kuala Lumpur, 23rd May, 1905.

E. A. O. TRAVERS,

State Surgeon, Selangor.

No. 6.] JUNE, 1905. [Vol. IV.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M.A., F.L.S.,
Director of Botanic Gardens, S.S.

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AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 6.] JUNE. [Vol. iv.

FIBRES—(*continued.*)

The Bast fibre trees and shrubs are less used as sources of fibre than the herbaceous plants, as there is more trouble in growing and preparing the fibre. Several, however, have a special value of their own, and some of the others are collected in the forests by natives and brought in for sale in the villages. One of the only native fibres brought in for sale into the small country shops is the bast of the Terap, *Artocarpus Kunstleri*, a common tree in these parts. In Malacca and elsewhere where the tree is abundant the Tutok (*Hibiscus macrophyllus*) is in request for rough cordage, while many other shrubs and small trees growing in the forests produce a ready-made tying material, so that one may say one can always find string in a wood.

Artocarpus Kunstleri, King. Terap is a common tree often attaining a very large size, occasionally 100 feet tall or more. The leaves are lobed when young, and often quite narrow and deeply cut in shoots rising from a stool. In adult trees they are entire and oval, hard in texture, and somewhat pubescent beneath. The fruit when ripe is globular and it is eatable, being sweet in taste. The stem contains a quantity of sticky latex which, however, never sets firmly, so that it cannot be used as rubber, but it is much used as a birdlime. The bast can be removed by cutting through the bark and stripping it off and beating it out with a club. It is thus taken off in large sheets of a dark brown colour and very tough. In this form it is used by the Sakais for clothing. It is easily torn longitudinally into strips and twisted into rope.

A good deal of a bast similar to that of Terap is imported into Singapore from Pulau Bungoran and Celebes, and sold at 15 cents a catty. I doubt its being the bast of *A. Kunstleri*, as that does not occur so far East, as far as I know, but the bast is sold as that of Terap.

Some years ago an attempt was made at the Botanic Gardens, Singapore, to clean and prepare the fibre of the Terap tree, to see if it could be used commercially, and a strong white fibre was prepared, but the staple is short and the fibre much curled and irregular, so that the mass looked more like cotton waste than a good working fibre.

A. incisa.—Bread-fruit. This is not very extensively cultivated here, as it never seems to fruit well, and the fruit is inferior and not very popular. I do not know of the bast being utilized here as fibre, but it is said to be so used in the Eastern islands.

A. integrifolia—The Jack also produces a bast fibre, occasionally used in India but not utilized here, and *A. Lacoocha*, a wild kind of bread fruit not rare in the Peninsula, also is said to give a fibre.

It is probable that all the species of the genus give a more or less useful fibre, and that the bast of more than one of the native species is sold in the markets as that of the Terap.

Antiaris toxicaria.—The Upas tree (Ipoh). This gigantic tree, allied to the *Artocarpir*, is better known for its poisonous latex than for its fibre. Its bast is used apparently in India to make sacks, the bast being removed entire, beaten and soaked in water. It is used for native clothing, and rope also in Ceylon. The tree is not very common in the forests, and as the Sakais value it for its latex used in poisoning their darts, they would naturally be unwilling to cut a tree down for its bark while they can get the less valued Terap tree.

Akar Karas.—This is a pale colored bast obtained in Malacca and brought in in half-inch strips. The bast is not very strong, and inferior to that of Terap. The ultimate fibres are very short, white and woolly. I do not know at present from what plant this bast is derived. It has the appearance of a *Ficus* bast.

Akar Tabak.—Also from Malacca and of unknown origin is a stronger bast, light colored, resembling that of *Ficus Benjamina*. It is in narrow strips, and the fibre is short, white and woolly.

Kudu.—Many years ago Mr. H. VAUGHAN STEVENS brought from Kemaman, a curious woolly light amber brown bast in sheets, very soft, with a woolly short and weak fibre. It was one of the cloth basts used by the Sakais for clothing but from what tree it was procured I do not know.

All of these have the appearance of being Urticaceous Fibres, either *Artocarpus*, *Antiaris*, or (the Akars) perhaps *Ficus*.

Ficus Benjamina.—Roxb. "Waringin." This tree, common in cultivation, produces a bast of considerable strength, it is of a light brownish color, thick and irregular. The ultimate fibres are white and woolly, lighter in color than those of the Terap, but otherwise similar. Specimens of this bast were received from Johore some years ago.

F. chartacea.—A small twiggy shrub, common in jungle, also supplies a bast used as occasion requires by Malays. It is called Kelampong Mata Punei, Kelampong Agas, and Poko Rami Hutau.

Hibiscus macrophyllus.—Tutok. This fine tree mallow is not rare in the forests of the low country of Malacca. It attains a height of about forty feet, and has rounded pubescent leaves and large showy yellow flowers with a purple centre. The bast is light brown in color and collected in strips ¼-inch wide and of good length. It is readily split lengthwise and easily twisted, flexible and strong. A good sample of rope made from it in Malacca is among the collection of fibres in the Botanic Garden Museum.

H. tiliaceus.—Waru, or Baru. A common sea-shore tree occurring all over the tropics. The bast is similar to that of the preceding. Its fibre is said to be not as good as the best jute, but to gain strength by wetting. Though used as a native fibre all over the world, to a certain extent, it does not seem to find its way into commerce, and here, at least, is seldom used.

Hibiscus elatus.—Cuba bast. This West Indian tree mallow has long been cultivated in the Botanic Gardens, Singapore, where it grows readily, if not very fast. The bast is in constant demand in Europe at a high price, but the supply is inadequate. The bark is said to be obtained by cutting down the tree, peeling it, separating the bast from the outer bark and drying it in the sun. Its chief use is in millinery for hats and such like work. Its porousness makes it absorb dye easily without impairing its texture.

As the supply falls far short of the demand a substitute for this fibre is much required.

Thespesia populnea.—Also known as Baru, is a common sea-shore tree over most of the tropics, very similar in appearance to *Hibiscus tiliaceus.* The leaves are, however, smooth ovate cordate acute. The bast is something like that of Tutok, rather darker red-brown, strong and pliable. It is occasionally used in the Peninsula, as it is in most parts of the world, for cordage. In Demerara it was said to be used formerly for coffee bags. The supply is not sufficiently large for its commercial use.

Alchornea villosa, Muell (*Euphorbiaceæ*). A common bushy shrub, about 6 feet or more tall, gives a bast which the Malays use for making twine. It has ovate dentate leaves, small green flowers in slender spikes, and a woody green three-lobed capsule. The Malays call it Ramin (or Rami) Bukit, Sumin Jantan, or Sumin Bukit.

The trouble of collecting the bast is rather against the use of this class of shrub.

Macaranga Javanica, Muell (*Euphorbiaceæ*). This common tree appears as secondary growth in abandoned cultivated ground in great quantity, and grows with considerable rapidity, but never attains any great size. It is commonly known as Balik Angin.

The chief value of the plant consists in its aid to reafforestation, as it soon covers the ground, but some years ago a planter, Mr. DUPOY, in Singapore, having somehow mistaken it for Ramie, stripped the bark and extracted a fibre of fine white colour but not very strong.

Mallotus Cochinchinensis, Muell (*Euphorbiaceæ*). An almost equally common tree, also known as Balik Angin, was also experimented with by Mr. DUPOY.

The bast of both these trees is thin and red-brown, strong and tough. The fibre is remarkably fine and white, rather short and not very strong. I do not remember ever to have heard of natives using it for tying purposes. Of the two trees *Mallotus Cochin-chinensis* appears to have the best bark.

Gnetum.—There are several species of these remarkable climbers in the forests, in some of which the lianes attain a considerable thickness. The bark is thickened often in rings, giving the lianes a knotted appearance. The common name for this set of plants among the Malays is Akar Dagun. Other names are Akar Mantada, A. Putat, A. Sebuseh paya, A. Saburus, A. Tutubo (*Gnetum funiculare Bl.*) A. Jullah, A. Perut Sumba, A. Sacherit Hitam, A. Serapat Jantan, and Selampah for *G. neglectum*. Akar Tali is a name also occasionally used for the Gnetums. The bark of these plants, produces a fibre used as string by Malays in the forest, and from a sketch by VAUGHAN STEVENS I believe that the "Lennow" of the Sakais is one species, probably *G. funiculare*. This, he says, supplies the Sakais with thread for sewing. The bark of *Gn. Gnemon*, the Maningo, a tree cultivated occasionally for its fruit, is used also in many parts of the East, and *G. scandens* of the Indian islands is used by the Andamanese for making fishing nets.

Anodendron paniculatum.— A. D. C. (*Apocynaceæ*), a big climber, common in India and Ceylon, but rare in the Peninsula, is said to give a strong and fine fibre much used by the Cinghalese.

Cryptostegia grandiflora (*Apocynaceæ*), a common garden plant here, a climber with purple flowers, is also recommended as a fibre plant, the fibre resembling flax. It seems never to have been properly experimented with, however. Attempts have several times been made to utilize the plant as a rubber producer, but the product is inferior and the expense would seem too great for it to be remunerative in that way.

Calotropis gigantea (*Asclepiadeæ*).—Mudar fibre. A shrub with much latex and rather fleshy leaves, with pale violet flowers. The common wild plant here appears to be the form known as *C. procera.* It occurs on sandhills and other such places near the sea, but in no great quantity. The bast fibre is said to be as strong as flax and much used in India. Attempts to cultivate it commercially in India seem to have failed owing to the shortness of the fibre and its very small proportion to the weight of the plant. The seeds are covered with a silky flax which has been utilized also for spinning. The plant, however it might be successfully grown in the dry parts of India, does certainly not thrive in the Malay Peninsula, nor become sufficiently vigorous to be at all recommended as a plant to cultivate for its fibre.

Urera tenax (*Urticaceæ*), was introduced from South Africa to the Botanic Gardens some years ago as a fibre plant. Its growth has been remarkably slow, and it is not at all suited for this climate.

Among other plants which have been utilised as bast producers but of the value of which little is known and which are not in sufficient quantity or sufficiently easily grown to be valuable are :—

Bixa Orellana.—The Arnotto, cultivated for the red dye from its seeds. This is said to produce a fairly good fibre. It is a native of South America, but has established itself in many parts of the Peninsula.

Artabotrys spp.—Jungle climbers of moderate size of the fibre of which little seems to be known.

Anona muricata.—The Soursop. This fruit tree is stated to give a good bast fibre, but it is hardly likely ever to be made use of, as it is quite a small tree and the removal of the bark would kill or injure it, while the plant is more valuable for its fruit than for its fibre.

Cordia myxa.—A sea-shore tree, the bark of which is used in India for cordage, etc. It does not appear, however, to be very strong, and the tree is not common in the Peninsula.

Melochia arborea (*Sterculiaceæ*).—Not common here. A small tree of which the bast is used in the Andaman islands for making nets.

Wikstroemia Indica (*Thymeleaceæ*).—This little shrub has a very strong tough bark. It is common in some places, especially the sandy coasts of Pahang. The whole plant is twiggy, about 4 feet tall, with yellow Ixora like flowers and red drupes. It is readily grown from seed, and is closely allied to, if not identical with, a Pacific island plant which is used in Hawaii for nets, cordage, etc.

Commersonia platyphylla, Forst (*Sterculiaceæ*).—A tree about 15 to 20 feet tall, with corymbs of white flowers and bristly fruit known as Durian Tupai. Common in secondary jungle in Singapore and elsewhere. The bark is tough, and an almost, if not quite, identical species in Australia gives a bast valued by the Aborigines as the best for making nets. It is a dark colored tough fibre, but it is not used by natives here.

PROFITS ON A SMALL RUBBER ESTATE.

The following paragraph was published in a local paper on April 19th under the title "WHERE IS IT?":—

> "The '*Ceylon Observer*' publishes the following extract from a letter dated somewhere in Malaya—no need to specify—7th February, 1905: 'Unfortunately,' writes the correspondent, 'I have only 5 acres of rubber yielding at present. I get about $100 per acre a month profit from them.' One is inclined to think 'If these things be done in the green tree?' But present prices remind one that there are places where angels fear to tread."

I visited at Easter the plantation probably referred to in the above paragraph. I have known the place from its commencement. The seeds were procured from our Botanic Gardens at Tanglin, and the young plants planted early in 1898, among old Liberian coffee, 12 feet by 12 feet apart, making about 300 Para rubber trees per acre. The land is low lying but not wet, and has been under cultivation for many years, formerly with gambier and afterwards with coffee. The soil is somewhat sandy. The rubber trees are healthy, but not specially large in size, the girth at 3 feet from the ground varying from 20 to 36 inches, the average being considerably under 30 inches. The larger trees were tapped at five years old and afterwards, but from July, 1904, onwards, the plantation has been regularly tapped at the rate of 150 trees per month. The average return to end of March has been 75 lbs. dried rubber per month, or say ½ lb. per tree.

The monthly expenditure is $50, including wages of 4 coolies employed in tapping, curing, weeding, etc., so that at last year's prices the profit exceeded one hundred dollars per month. The owner expects that this year, with increasing yield from the 1,500 trees and prices at $3 per lb., that the monthly profit will amount to two hundred dollars.

There are no white ants, nor any trace of fungal or any other disease on the trees. The figures speak for themselves.

There have not been many cultivations which have returned so large a profit on so small an expenditure.

H. N. RIDLEY.

ISOPTERA BORNEENSIS.

The Dipterocarpous tree, *Isoptera Borneensis*, is one of the sources of oil nuts producing an important oil known generally as Minyak Tenkawang. We are indebted to Mr. JOHN ALLAN, of Warrington, for an account of the habits of the tree and the methods of preparing the oil in Pontianak, where he has been lately travelling to study the origin of the oil seeds of the East.

Isoptera borneensis (*Dipterocarpeæ*), is a native of Borneo, Bangka, and also of Pahang, Muar, and Perak, where I have occasionally met with it. It is a tree of very large size, from 100 to 150 feet when full grown, but unlike other Dipterocarpous trees it flowers and fruits often when quite small, so that one can gather the flowers from the ground. The leaves are bright green, oblong, acuminate, 4 inches long and two across, strongly ribbed, thin in texture, and glabrous. The flowers in short racemes small and yellow, are sweetly scented of vanilla, and in Pontianak Mr. ALLAN says that the women are fond of gathering them, when the tree is small enough to reach, to put in their hair. The flowers are produced in October, the fruits in January. The tree usually grows on river banks in wet silt mud in which one sinks half-way up the leg. I have, however, seen it in dryer spots. The fruit is half globular, something like an acorn, about half-an-inch long and wide with five rounded ovate wings spreading out flat, reddish, and strongly ribbed, three of the wings are ⅜-inch long, the other two hardly half as big. The fruit falls into the streams or rivers near which the tree grows and drifts down. The natives of Pontianak catch them in nets, or gather them in bends of the river, where there is a block from a fallen tree or projecting root. The nuts are then dried in the sun and pounded in a rice pounder, which here is trough or boat shaped. The pounded mass is then boiled in water and the fat skimmed off, strained through a simple bamboo strainer and poured into joints of bamboo. The fat is hard and waxlike. It is used for cooking, imparting a peculiar flavour to the meat, and is also used for greasing the copper pans in sago and tapioca making, when pearl or bullet sago or tapioca is being made.

The Minyak Tenkawang is also used for soap making in Europe, but it is a hard fat and requires much treatment. The tree is called Sinkawang in Muar, and Larat Api in Pahang. BURCK gives its name as Tengkawang Trendah in Banka. Mr. ALLAN states that it grows in clusters, many trees together, which is not usual in *Dipterocarpeæ*, though it is characteristic of *Dryobalanops Camphor* the Camphor tree.—*Ed.*

MANUFACTURER'S OPINIONS ON SHEET RUBBER PREPARED BY PLANTERS.

An interesting series of opinions of managers of well-known rubber firms as to the advisability of planters sending their rubber to market in the form of thoroughly washed and dried sheets is published in the "*India-rubber Journal*" of March 13, p. 296, by the Editor of the "*International Rubber Planter's Association.*"

Mr. P. M. MATTHEW, of the Victoria Rubber Company, Limited, writes: "I have before me at the present time a sample of Plantation rubber of which some 60 tons have passed through the Liverpool market during the past year. The last of this was sold at about 6*s.* 2*d.* per lb., which is probably a record price for raw rubber. The best of this rubber has been imported in sheets averaging about $\frac{3}{16}$-inch in thickness, and this, I consider, is the best possible form in which it can be imported. So far as I am aware, there is no reason why the latex should not be coagulated in this form in troughs or vessels of convenient shape and size, and such a plant could be installed at a comparatively trifling cost. The subsequent drying of the rubber is a simple matter, and can be, of course, carried out in various ways as may be most convenient. As regards the suggestion that the rubber could be more conveniently prepared and exported in washed sheets, that is no doubt the case, and, from the manufacturer's point of view, it could not be in any more suitable form. The present conditions of the rubber market, however, render it necessary that the greater part of the rubber imported should pass through the hands of dealers and brokers, and, that being so, no manufacturer would buy the rubber in the form of washed sheets, for the simple reason that it would be impossible for him to tell whether it was adulterated by admixture of inferior rubber or not. From the point of view of the planters I consider it of the first importance that the rubber could be easily identified, which would not be the case were it shipped in the ordinary form of washed rubber. It is not too much to say that such treatment would probably reduce the present market value by at least 25 per cent. I do not think it would be practicable to mark the product of the various plantations as has been suggested."

CHAS. MACINTOSH & CO., LIMITED, say: "There is no doubt that it would be greatly to the advantage of the India-rubber manufacturer if he could buy his raw rubber clean and dry. Under the very best modern system of collection and preparation, rubber comes to market cleaner and dryer than has ever been known before, but still the manufacturer has to put it through his washing rollers and stoves to eliminate any foreign matter that may have collected on the surface of the cakes or biscuits, even if there is none inside the rubber itself. The important matter for the planter to consider is, how can he collect and prepare his rubber for the market as clean and dry and as free from nitrogenous matter as possible. The reasons for this are, that clean and dry rubber fetch a higher price in the market, cost less in freight and handling, and is less liable to deteriorate in transit and in store, than rubber which is collected by methods in common use at the present day. These remarks, however, only refer to the better qualities, as, with the commoner rubbers, say of West Africa, if it were not for the moisture contained in them, they would arrive in Liverpool in the condition of bird-lime or melted pitch. The best quality of Ceylon or Malay State rubber, is, so far as we can judge, no better than fine Para rubber. It fetches a higher price solely because it comes to market drier and cleaner. It is impossible to say, if the planters were to wash and dry their rubber before sending it to market, whether it would save the manufacturer the cost of cleaning, until the experiment had been tried on a commercial scale, because a few small specks of sand or grit adhering to the surface of the sheets might spoil the articles made from the rubber, and few manufacturers would care to run the risk of using rubber straight from the packing case. It is quite possible to imagine such a system of packing as would prevent the intrusion of dust, dirt, or moisture, but such a system would have to be invented before the manufacturer would venture to forego the washing process in his own works. Therefore, under present conditions, or conditions likely to prevail in the near future, we are of opinion that it is not advisable for rubber planters to wash and dry rubber on the plantation, except for the purpose of sending it to market as clean and dry as possible; and that, as far as we can see, it would not obviate the necessity of the cleaning and drying process in the manufactory."

Mr. Jno. HOOPER, of Hooper's Telegraph and India-rubber Works, Limited, London, says: "I have nothing but commendation for the plan proposed, so long as the rubber is used for mechanical purposes or waterproof goods, as it must save the manufacturer charges for extra freight and washing and drying space, if the rubber can be cleansed and dried efficiently before being exported. But when rubber is used for electrical purposes as insulating conductors—it is very necessary to be careful as to the class and condition of the rubber used. For our own special insulation, we have found that the lumps of fine Para as imported, with a few exceptions, can be relied upon if treated in the right manner from start to finish of the manufacture, and any lumps which are not satisfactory can be used for other purposes. If these unsatisfactory lumps had been washed and dried and mixed with the bulk before being exported, it would be practically impossible to ensure the rubber being entirely of the best quality without adulteration."

DAVID MOSELEY & SONS, Ltd., Manchester, reply that: "Several planters have been to see them and they have explained that they are at present preparing the rubber in Ceylon and the Straits Settlements in the best manner."

The AVON INDIA-RUBBER Co., Melksham, Wilts., say that: "If it were possible to absolutely rely on efficient washing and drying on all plantations, it would undoubtedly be a great advantage. We fear, however, this would be impossible, and we, therefore, consider that it would be preferable for manufacturers to do this work themselves."

This is an interesting series of letters, and the Editor of the "*India-rubber Journal*" promises a further instalment of those he has received from other manufacturers. Several ideas are suggested on reading them which may be worth recording. One is that of the relations of fine Para rubber to that of Plantation rubber. No one, I suppose, thinks that any actual difference in the rubber itself has been produced as yet, at all events, between that of trees growing on the banks of the Amazons, and that of Selangor. If there is any difference it would doubtless be in favour of the older trees in Para. The difference is solely in the method of preparation. The clumsy aboriginal method in use in the Amazons, requiring a great deal of skilful hand work, must produce at times unsatisfactory lumps. But in the plantation methods, which are easier and more mechanical, and are superintended by a European manager possessing a knowledge of what is required, rubber on all estates under European management can be made perfectly homogeneous. It is just the same difference as there was between the sugar prepared by natives of India with a wooden mill, and the sugar as manufactured by a well-equipped modern manufactory. There would be no more difficulty in the planter's turning out tons of rubber completely homogeneous all through, in, say, the form of crepe. No good planter would allow any latex accidentally damaged to go into the machine with the good stuff. The accidental contamination of the rubber on the way home, referred to by Mr. MACINTOSH, would be less easy to obviate, but it would be noticed that this contamination would be entirely external, and could be removed without breaking the rubber up again.

As rubber is so easy to grow and manufacture here, we may expect that natives, especially Chinese, may go into the business, and, in the usual native method, eventually put very second-rate stuff on the market. With their skill and perseverance in discovering the best methods of adulteration, biscuits resembling those of European plantations, but adulterated, might be made. But the small grower who would try to supplement his product by adulterating it, could not afford a crepe machine. He could imitate biscuits, but not washed and cleaned crepe. In this way, rubber as crepe, would be more or less guaranteed as pure.

RUBBER MACHINES AND OTHER IMPROVEMENTS.

A great deal has been written in Ceylon papers about a new machine, or process, for dealing with crude rubber, invented by Mr. D. K. MICHIE and Mr. G. H. COLLEDGE, and for which a provisional patent has been taken out. It appears that the latex is treated with acetic acid and put into a centrifugal separator, and in a few minutes the rubber coalesces. The rubber is then passed through a mangle, or some such appliance, rolled into a thin sheet, and then cut up in strips and dried. By this method it is said that the rubber can be dried in twenty-four hours. As Sir WILLIAM THESELTON DYER remarks in the "*India-rubber Journal*," it is rather difficult to see what is patentable in this process. The chief feature, the centrifugalization of the latex, was patented by Biffen in 1898, and an apparatus for centrifugalizing was invented in England not long after, based on Biffen's idea, but this turned out a complete failure. A specimen of the machine was presented to the Botanic Gardens Museum by Mr. PEARS.

At present one only has the various reports in Ceylon journals to judge of as to the merits of Mr. MICHIE's machine. Mr. BURGESS wrote, however, on his way home, that he had seen the design, and did not seem very much impressed with it. Whether centrifugalizing the latex will be of any use remains to be seen. but it may be noticed that while in Biffen's patent the latex was supposed to be coagulated by the action of centrifugalizing only, in Mr. MICHIE's machine we learn from the reports that acetic acid has to be used in coagulating, before the use of the centrifugalizor. We have not yet heard of the process being in use in any estate in Ceylon, and have not had any account of the working of it, though the scheme was hailed by the Ceylon press as a wonderful success long ago, when the affair was in its experimental stage. Any further information on its working is to be desired.

Meanwhile, the Selangor washing machine is in full work, and there is a photograph of a large strip of crepe rubber, made by Mr. W. W. BAILEY, of Lowlands, in the "*India-rubber Journal*" of March 27. The sheet is precisely the same as is turned out of fine Para in the works, but contains rather less resin and less insoluble organic matter. The latex arrives at the store at 12 noon, is coagulated by 6 a.m. next morning, and in its soft wet condition is put through the washing machine, and after, carefully dried.

Several rubber journals have commented on the immense number of tins required for collecting the rubber, and enamelled iron plates for making the biscuits in, and remark that the great number of these required would be cumbrous, and hopelessly impossible to work with on large estates. It is difficult to see how one is to avoid the use of a very large number of collecting tins, but there is no difficulty about the coagulating plates. Writers do not seem to have understood that these plates and the resultant form of biscuits have only been used because they could be easily got at the nearest shop, and it would be just as easy to use plates of any size or shape. It is a mere matter of getting the enamel plates made to suit requirements.

Pozelina and Seringuina are two inventions of rubber explorers in South America. They are chemical preparations for retarding the coagulation of latex so that it may be brought in a liquid state to the factory. Formaline, as all planters know, does this work well enough, and is about as cheap as Pozelina. Neither of the two new preparations have, as far as I know, been introduced to this country yet.

CORRESPONDENCE.

COAGULATING RAMBONG.

To The Editor,

The "*Agricultural Bulletin of the Straits Settlements and Federated Malay States.*"

Coagulation of the Latex of Ficus Elastica.

Sir,

I noticed in an article on the above subject in your estimable Journal of January last, that Mr. P. J. Burgess makes a statement that Ficus Elastica latex refuses to coagulate, and that he has devised a method of churning it up with a 2 p.c. solution of tannic acid in the proportion 5 parts of solution to 95 latex. He also states that the Ficus Elastica yields an abundant latex which can be easily collected and which is quite liquid and remains so an indefinite time.

It may, perhaps, interest your readers to know the experience of one who has tapped and watched the tapping of Ficus Elastica trees for the last three years in the Government Plantations of Charduar and Kulsi in Assam, where the latex of Ficus Elastica by no means remains liquid for long. The cuts are made by a V-shaped chisel or gouge devised by Mr. D. P. Copeland, Deputy Conservator of Forests, they are made at right angles more or less to the line of growth of the stem, aerial root, or branch, at one and a half feet apart, half round the trunk, aerial root, or branch, that may be tapped. Cuts made vertically to the line of growth do not yield so much rubber for a similar length of cut as those made horizontally. Endeavours are made to just only cut down to the cambium layer and not into the wood, so that the wound may heal as soon as possible. Just after the first cut the latex flows freely, fills up the gaping cut and flows over, but before very long, say within two minutes at the outside, the flow ceases because the latex begins to coagulate of its own accord in the cut. Arrangements are made to collect the latex that falls on mats made of thin strips of bamboo woven together. Little boys on the ground shift these mats about under each cut as the man up the tree makes it, so that the dripping latex can cover the mat. Before the end of the day this dripped rubber has joined together on the mat and has coagulated and formed a regular skin which on drying can be pulled off say in 48 hours, or less sometimes, and be further dried. The latex that has coagulated in the cuts turns a reddy brown colour, highly appreciated in the London market, and is pulled out of the cut in about 48 to 56 hours afterwards, yielding fine elastic fids of rubber. This rubber is then slightly handpicked to get rid of pieces of bark, dirt, etc., and is laid out on shelves in an open shed to be air-dried. After drying this fine red rubber that coagulates in the cuts is pressed by a screw press in cubes of one hundredweight each, which are wrapped round with cheap white cloth and a double covering of gunny bag. The cubes retain their shape and are easily portable. Such rubber has fetched four shillings and threepence a pound recently in the London market. The latex that dripped on the mats is similarly cleaned, dried. and packed separately, and realizes very little less. This latter, which we locally name "mat" rubber, is sometimes liable to ferment, as some interior portion of a large drop of latex has not perhaps properly coagulated, and hence at times this rubber sometimes fetches a penny less per pound. Formerly mat rubber used to turn black and did not fetch so much. Latterly I ordered the mats to be soaked in a solution of the bark that comes off the tree in tapping. This dyes the mats red. The white latex when dripping down seems to be tanned by this dye on the mats in a similar way to that in the cuts where latex rests and coagulates. The reason for early coagulation is perhaps due to this tannic acid effect of the bark on the sides of the cut and the dye on the mats. The "mat" rubber we export is mostly red. Of the whole outturn of our plantations, some 15,000 lbs. last season, the proportion of "mat" rubber to that collected from the cuts as coagulated very elastic rubber was only 25 p.c. of the whole outturn. The method of collection seems, therefore, as good as can be devised. Of course it is more costly to win this latex from the Ficus Elastica than it is to win latex from the Para (Hevea Braziliensis) tree, owing to the fact that the men who operate have to climb the trees twice to get the rubber.

CAMP DARRAGAON,
GOALPARA DISTRICT,
6th April, 1905.

E. S. CARR,
Cons. Forest, Assam.

TAPPING IN RUBBER TREES.

(Plate IV.)

We give in this number a photograph of a tree which shows herring-bone tapping scars of three dates. The tree in the Botanic Gardens of Singapore was planted about 1886, and is thus nineteen years old. It is one of a row of trees planted about 6 feet apart, but having no trees on either side of the row, and so a fair space and plenty of light to grow in has attained a large size. The front herring-bone tapping was made last year, and the one on the right as you face the tree some years previously. That on the left was the earliest. It will be seen how easily the side cuts of the herring-bone of the second tapping can be made to alternate with those of the first years. The tree for tapping purposes has practically four sides, and is best tapped in the following order, first year, front; second year, back; third year, right side (between the last two); fourth year, left side; fifth year, front again. By this time the first tapping will have long been covered with a layer of wood and bark, usually showing only an outline on the bark of where it was tapped before. The healing up of the tapping wounds rapidly is a thing to be desired. It usually takes about three months for a tap cut to heal over, but much depends on the weather. If the weather is dry the growth of the new bark is much slower than in the wet weather.

WASHED RUBBER.

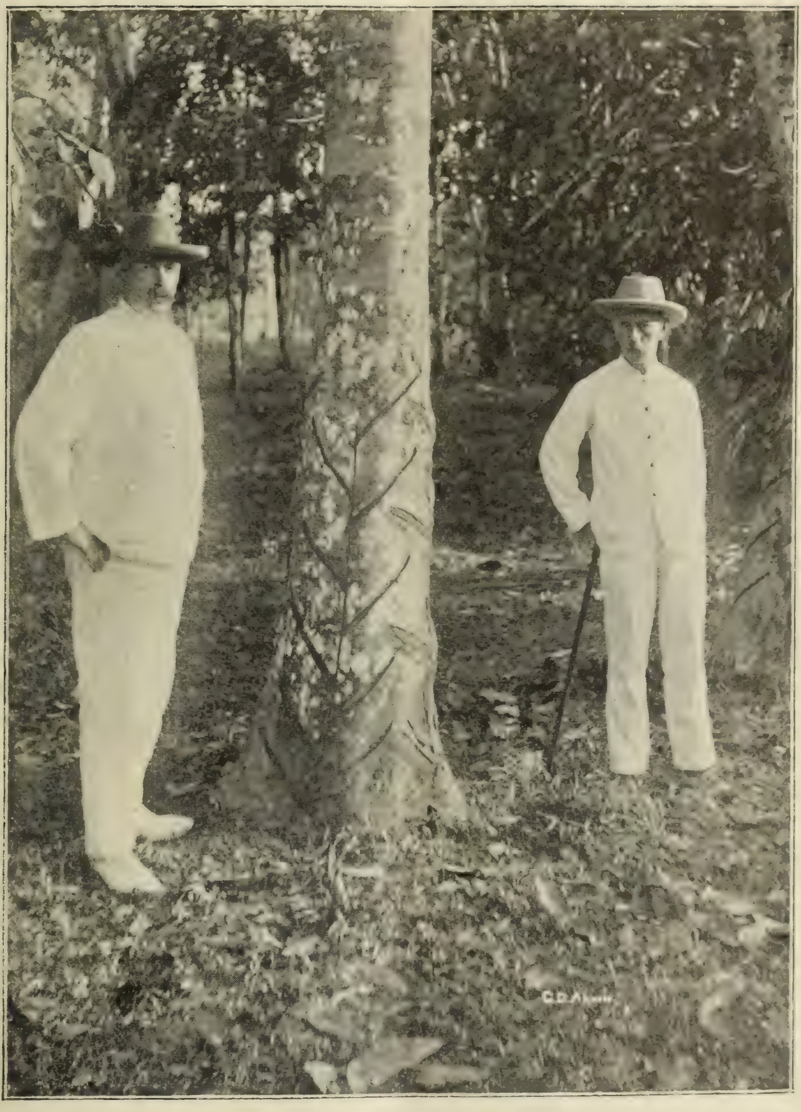
By P. J. Burgess.

The response which has been made by the manufacturers to the request for criticism of the proposal to wash and clean plantation rubber on the plantation as part of the routine of preparation is most gratifying, showing as it does that the idea is being fairly considered, and promising to treat the matter on its own merits.

A reference to the "*India-rubber Journal*" for 13th February, will show that the first experimental washing machine in the East was working in August, 1904, at the Argi-Horticultural Show at Kuala Lumpur.

Since then several of these machines have been established on different plantations, but the output of rubber has, up to the present time, been small, the plantations being young, and extensive tapping only just commencing.

On Lowlands Estate, however, the machine has been in constant daily use for several months, and a large and an increasing amount of rubber is being turned out in the clean, dry, washed condition, small samples of which have already been sent to England.



Old and recent Tapping scars.

Within a week or two a consignment of over 1,000 lbs. weight of this rubber is exported, and this will represent the first large quantity of the material which has been put upon the English market, and will be a fair test of the way in which such rubber bears packing and tropical transport. Samples of this shipment will be distributed for inspection and criticism, and any suggestions as to improvements or alterations in the manner of packing for transport will be welcomed.

It may be pointed out that this shipment is not altogether an experimental one, but rather the first of many. This estate alone is now capable of supplying large monthly amounts of rubber of regular and uniform quality, and what is now an accomplished fact on one estate will soon be the condition on many others.

With regard to letters published in the "*India-rubber Journal*" of March 13th, in criticism of the method of preparing washed rubber on the plantations themselves, they raise two points for consideration, the one is that plantation-washed rubber may be adulterated with an inferior rubber, and the second that the rubber may not be sufficiently clean—either through imperfect washing in the first instance or through careless handling and packing subsequently.

The fear of adulteration is quite natural, but in reality will not be justified when dealing with rubber from large estates under European management. The incentive to adulteration is in the East, with present conditions of the rubber market, not felt at all. All rubber is commanding good prices, and it may be quite safely believed that an estate which has gone so far as to establish a washing apparatus in order to turn out pure, clean, dry rubber, will not jeopardise its reputation and good name for the sake of making a temporary trifling increase to profits which are already large.

The conditions under which the plantation and preparation are carried on are not, in Europe, sufficiently realised. To obtain on a plantation of Para any quantity of an inferior rubber is difficult, and could scarcely be done without a considerable degree of publicity. It will be easier for the management of the estate to turn out pure and unadulterated rubber than to wilfully adulterate the product.

The simplest solution of this difficulty of fear of adulteration of washed rubber will be to sample it and have the samples analysed and technically examined, if a simple inspection by expert buyers is not sufficient for accurately estimating the quality. In my own opinion, however, the pale colour, smell, and general appearance of this plantation washed sheet will be quite sufficient to enable an experienced man to say whether the rubber be pure Para or mixed with other rubbers, and that with an accuracy as much as, or more than, in the case of plantation biscuits.

Further, as each plantation would mark and seal its cases of rubber, the reputation and standing of the estate would soon be sufficient guarantee of its purity.

The second objection of insufficient washing or subsequent contamination can only be a transitory one, to be removed directly the evil is pointed out.

The rubber planters and producers in the East are quite willing to make any change and improvement in preparation which will tend to the production of purer rubber or an article in any way more fit for use by the manufacturers. The interests of the producers and manufacturers do not conflict, and any suggestions which tend to improve the preparation of the raw product will be warmly welcomed. At the same time it must be pointed out that the use of some machine on large estates which have had experience of the advantage consequent on the use of a washing machine for preparing raw rubber are so convinced of its value, that to abandon it and revert to the old system of hand labour and petty coagulation in pots and pans, the tedious and troublesome drying, and all the evils which follow in the train of an accumulation of rubber sheets saturated with a putrefying solution of gums, sugars and albuminous matter, to go back to these conditions is impossible, and such a retrograde movement would be detrimental to the best interests of the planter or the manufacturer. These views, however, I have already expressed publicly, and I do not wish to merely repeat what I have already said before, but that the interests of the planter and of the manufacturer cannot conflict I am convinced, and any apparent difference is due to imperfect knowledge each has of the other's province. I have quite recently arrived in England from the Malay Peninsula on a special mission, of which one of the principal objects is to bring into closer touch the East and the West, the producer and the manufacturer. To do this one must have a knowledge of the conditions and a knowledge of the details of the work at each end, and, while in England, I wish to see personally those who control and conduct the manufacture of rubber goods, so that I may perhaps put more clearly before them the real condition of the cultivation and preparation of the raw rubber in the East, and at the same time learn from them their views and requirements, and some knowledge of the reasons underlying them, by seeing the main outline of the processes through which the rubber passes in the course of its manufacture.

The absence of such knowledge has been felt in the Malay States, and its influence has been all on the side of retarding the development of rubber planting, that industry in which the possibility of abundant future supplies of raw rubber so largely depends.—"*India Rubber Journal*," *April* 10, 1905, *p*. 366.

MITES IN RUBBER NURSERIES.

My attention has lately been attracted to several cases where the seedlings of the "Para" rubber tree presented a somewhat unhealthy appearance, and on more than one occasion I have been assured that this was there natural appearance during, or immediately after, a spell of dry weather. It is evident, however, that all is not as it should be, and if the growing point or the very young leaves are closely examined, a minute insect will generally be observed moving rapidly about, chiefly on the under side of the leaf.

This is not a true insect, but one of the Mites (*Acarinæ*) and allied to the pests that infest and produce the galls and leaf blister on plants. One of the best known of these Mites is that commonly referred to as "Red Spider" (*Tetranychus telarius*), which is very common in hot houses in Europe, being especially abundant on various species of Acalypha plants of the same order as the "Para" rubber tree; other Mites are parasitic on animals, while the itching Mite is parasitic on man, causing the disease known as itch; the sensation which gives the name to the disease being due to the Mites burrowing in the skin.

In the particular case under note, the very young leaves fall from the plant before they are developed—in this respect the result is much the same as though the plants had been attacked by "Red Spider"—while those leaves which mature, present a crinkled appearance and are generally of a yellowish green colour, and will be found upon examination to be perforated by numerous holes, due to the punctures of the Mites when the leaves were young. Saprophytic fungi are also present, but the disease is primarily due to the depredations of these minute parasites.

Being so small, these Mites are apt to be overlooked, and the cause of the disease attributed to other causes; they can be detected by the naked eye by anyone possessed with keen eyesight, though a good lens or a microscope is indispensable to enable us to obtain a correct idea of their structure.

The particular Mite causing the disease alluded to above, is probably a species of Tarsonymus, but I am unable, with the literature at my disposal, to determine the species. This, however, is not of much consequence to the planter, as the cause and effect is much the same in the various members of this family. Mites are produced from eggs, and, as a rule, the young are provided with three pairs of legs: they thrive best in a warm dry atmosphere. When they occur on plants having smooth leaves, they can be kept in check by syringing with clean water, or with a solution of soft soap and quassia chips. Dusting the affected parts with tobacco dust will also be found very effective and perhaps more expedient: this should be done in the evening so as to reduce the risk of it being blown off, or washed off by heavy rain.

In one particular instance where the plants were badly affected, I attributed the attack to the fact that the young seedlings had suffered from an insufficiency of water at the roots. The nurseries had been made under the shade of large trees, and the seedlings had suffered owing to the fact that during a comparatively dry spell of weather, the soil, being full of the roots of the older trees, had become too dry to support a large number of seedlings growing close together in nursery beds. Moreover the beneficial effect of heavy showers in cleansing the foliage, such as we are accustomed to in a dry season, is lost to the plants when growing under shade.

This disease is chiefly limited to plants growing under unfavourable conditions, and is not likely to affect trees when once established. I am of opinion that it may be entirely avoided by making the nursery beds in a damp locality in such a position that the seedlings will derive the full benefit of a free circulation of air and be subjected to the full effect of heavy showers from time to time. The soil should be free and well drained, but capable of retaining plenty of moisture even in comparatively dry weather: if necessary, artificial irrigation must be resorted to, but care must be exercised that this is done thoroughly as opposed to frequently, an operation which would be worse than useless in the case of small seedlings exposed to the full blaze of a tropical sun.

STANLEY ARDEN,
Superintendent Experimental Plantations.

Experimental Plantation,
Batu Tiga, Selangor,
4*th May*, 1905.

THE AGRICULTURAL SHOW AT KWALA LUMPUR, 1904.

The Report on this Show, held in Kwala Lumpur, 5th, 6th and 7th August, has just been published. As it is rather too long to publish completely in the "*Bulletin*" we extract from it such facts as are interesting specially to the general public. It was agreed on all hands that the Show was a success, and the President, Mr. D. G. Campbell, attributes this to the members of the various Committees and District Officers who laboured so energetically for this end. "It cannot," he says, "be said that "the Show was held as the outcome of any special interest on the "part of the general public or even of the planting community, "on the contrary it was held at the instigation of the Govern-"ment." And it must be admitted it is true that a certain number of those who might have been expected to have been willing to assist for the benefit of the community appeared to misunderstand the rationale of such exhibitions, which are not for the benefit of the Government but strictly for the benefit of each and every resident in the Peninsula. As to the utility of these exhibitions Mr. CAMPBELL writes as follows:—

The Utility of Agricultural Shows.—The utility of such shows has often been questioned, but no one who saw the large and varied exhibits in the "Native Industry" section, and the ready sale which these exhibits met with, can deny that a great stimulus was thereby afforded to native industries; and, so long as the natives can rely upon being able to dispose of their productions at these annual shows, there is good reason to believe that some of the Malay arts and handicrafts, which, as the Hon. Secretary for that division remarks in his report, are rapidly becoming obsolete, may, at least to some extent, be revived.

Educational Value of Shows.—The practical demonstration on the preparation of rubber given by Mr. BURGESS, Government Analyst, Singapore, was of the greatest value, and my Committee is deeply indebted to him, as also to Mr. G. DEARIE RUSSELL, Manager, Federated Engineering Company, who constructed a rubber-washing machine on the principles recommended by Weber—for an exceedingly interesting and instructive demonstration; and one which will probably have a very important bearing upon the preparation of rubber in the States.

The educational value of these shows is a point which should always be kept to the fore, and every effort should be made to bring the natives within their educative influence. It is suggested that, in addition to such demonstration as the one referred to above, prizes should be offered for agricultural implements as the result of competitive trials, not merely as exhibits in the ordinary way.

REPORT ON DIVISION "A."—AGRICULTURAL PRODUCE.

Mr. L. C. BROWN had the charge of this department, which was really very well represented. He reports:—

As regards Division "A." I feel every reason to be proud of the exhibits, not only from the most satisfactory—but that the exhibits themselves would, as a whole, do credit to any show as the products of tropical agriculture.

The exhibits received came from the following districts:—

Perak.—Upper and Lower Perak, Krian, New Territory, Matang, Larut and Kuala Kangsar.

Negri Sembilan.—Seremban, Jelebu, the Coast and Tampin.

Selangor.—Kuala Lumpur, Klang, Kuala Selangor and Kuala Langa.

Pahang.—Only a small exhibit of padi.

Penang, Province Wellesley and Malacca, also contributed.

A few remarks about some of the exhibits deserving, I consider, special mention, may not be out of place, the more so as it will serve for reference and comparison with any future show.

Coconuts, of which there was a magnificent collection, both specimen and variety, may be said to have taken first honours, in so much that it was in this product for a very fine collection of varieties that Mr. E. B. PRIOR, Golden Hope Estate, was awarded the cup kindly presented by H. E. the High Commissioner for the best collection of agricultural products. The same estate received a first prize for an excellent sample of copra, while the Selangor Oil Mills were equally successful for a very fine sample of poonac manufactured in their factory. The products derivable from the coconut tree and its fruit were very much in evidence, and with respect to this, one exhibitor had baskets, brushes, ladles of all sorts, sticks, and some articles of such intrinsic value that he refused to part with them at any price. Excellent samples of sugar, coir fibre and twine were also on view, and it is to be hoped that at some future show, when the industry expands in all its branches, we may see rope, soap and coconut butter exhibited from some factory situated in the Federated Malay States or the Colony.

Rubber.—I was certainly disappointed that there were not more exhibits in this class; on the other hand, most of the samples were of excellent quality. Mr. A. B. LAKE took both the cups presented for Para; Kent Estate the one given by the Selangor Planters' Association; and Uganda Estate Mr. PARRY's prize; Mr. F. A. STEPHEN's exhibit being "highly commended," as also that of Mr. P. W. PARKINSON. Mr. W. W. BAILEY succeeded in carrying off the cup presented by the Negri Sembilan Planters' Association for the best sample of rambong.

Padi.—The various kinds, both as regards specimens and collections, were exceptionally good, but great difficulty was found in obtaining competent Judges for awarding the prizes, as the Judges appointed for this division expressed themselves unwilling to undertake the work, believing that they could not give fair justice in the selection, and it would be better if, in future, some special arrangement was made about this. Mr. BELFIELD, the Acting Resident of Perak, was good enough to present a prize for the best sample of padi, and this was awarded to Penghulu Kota Lama Kiri, Kuala Kangsar.

The Judges commented most favourably on the exhibit that took first in Gambier, and they were also very much taken by the best sample in white pepper, grown on Padang Rengas Estate, Kuala Kangsar. An interesting feature of the show was an excellent display of various fibres by Messrs. HOGAN & Co., which attracted much attention and easily gained the first prize. Exhibits of Liberian coffee, cotton, and tapioca (pearl, flake and flour) were all very good.

Special thanks are due to the Hon. J. ALLINSON, Messrs. RIDLEY and FOX, who kindly officiated as Judges, and I am particularly indebted to Mr. FOX for the valuable assistance he gave me in arranging and staging the exhibits, as also to Mr. ARDEN and Mr. J. P. SWETTENHAM for the help given me from time to time in the necessary preparations for the exhibition.

L. C. BROWN,
Hon. Secretary, Division "A."

REPORT ON DIVISION "B."—FLOWERS, FRUITS AND VEGETABLES.

Dealing with the three sections separately and commencing with that for flowers, plants, etc., the exhibits staged were poor, and had it not been for the enterprise of only about half-a-dozen exhibitors this class would have been a hopeless failure.

As it was, the value offered in first prizes amounted to $230, while only $60 were awarded by the Judges; and as regards second prizes, awards of the value of $15 only were made out of a provision of $35.

The collections sent by Lady TREACHER, MR. D. G. CAMPBELL, Mr. CHUA KIM KIAT, Messrs. YAP THYE KEE and TEH SEOW TENG and by Mrs. AH YEOK, divided practically all the prizes between them. Mr. D. G. CAMPBELL winning six first prizes, two second prizes, and one commended exhibit, while Mr. CHUA KIM KIAT won six first prizes.

Lady TREACHER won two first prizes for her collections of ferns, and Mr. LOKE YEW'S cup for the best group of Chinese plants arranged in fantastic shapes was awarded to Messrs. YAP THYE KEE and TEH SEOW TENG, Mrs. CHEOW AH YEOK winning first prizes for the best collection of flowering plants.

The only exhibit worthy of mention among the class for cut flower was the bowl of magnificent roses shown by Mr. EPHRAUMS, of Negri Sembilan.

The class for table decoration was well filled, and Miss ANDERSON, who very kindly consented to award the prizes, had some difficulty in discriminating among the six pretty tables of the ladies who competed.

The group of ferns, etc., staged by the Government Gardens, Selangor, were exceedingly effective, and as a general exhibit of flowers, fruits and vegetables, too great praise cannot be awarded to the Government Gardens, Perak, for their very representative collection staged by Mr. CAMPBELL, the Government Superintendent.

In the section for fruit, prizes to the value of $106 (first) and $42 (second) were offered for competition, the actual awards made by the Judges, however, only amounted to $67 (first), $30 (second), and $6 (special).

Mr. STANLEY ARDEN had very kindly offered a special prize to the value of $25 in this section for the best collection of cultivated fruit, but the Judges considered that there was not any collection of sufficient merit to warrant its being awarded.

The Land Office, Penang, won in this section five first prizes and five second, while next to theirs the best exhibits were those from the district of Jugra, which carried off three first and two second.

Mrs. MOORHOUSE won first prize in classes 31 and 32 for chutney and pickles, respectively; and Mrs. REYNE was awarded first prize in class 30, for preserved fruits.

Perhaps the most interesting class in the fruit section was No. 29 that for any variety of fruit not included in the official prize list. The first prize was awarded to Mr. W. J. COATS for his Brazilian pears, and a special prize to Mr. R. D. TOLLEMACHE for some exceptionally fine lemons.

The limes exhibited by Batu Caves and Kamuning Estates, and also the oranges grown by Mr. CHUA KIM KEAT, of Singapore, are well worthy of mention as showing what can be produced in the Straits.

The fruits exhibited purely by Malays were very poor, both in quality and quantity. The poorness in quality is due principally to the reason that the fruit season was only just beginning, but a great deal of it is attributable, as is also the paucity of exhibits, to the fact that only in the one district of Jugra did the District Officer seem to take any real interest in working up his Malays to exhibit, and having done so, in seeing that their collections were properly classified for staging.

This applies also to the section for vegetables, and until more interest is taken by the officers who are in touch with the Malays in their own homes, it will be impossible to ever get together a representative collection of what the Malays can do in the cultivation of the ordinary fruits or vegetables, for which there is the greatest demand.

As an illustration, and taking the section for fruits, prizes were offered in thirty-two separate classes, in twenty-one of which second prizes were also offered. Out of these only six firsts and six seconds were awarded to Malays of the F. M. S., and of that number again, three firsts and two seconds went to the district of Jugra alone.

To proceed to the section for vegetables. There were eighteen different classes in which first prizes to the value of $49, and seconds to the value of $23, were offered, the value of the prizes actually awarded being $34 in firsts, and $18 in seconds.

Mr. H. N. RIDLEY'S special prize in this section was won by Mr. FOO WHA CHENG, of Kuala Lumpur, for his collection of vegetables, the other principal exhibitors being the Land Office, Penang, with three firsts and one second, and the Jugra District with one first and two seconds.

The most representative classes were perhaps those for brinjals, pumpkins, watermelons and kladi, and it is perhaps worthy of mention that in the classes for such ordinary vegetables as beetroot, cabbages, onions and artichokes, no exhibits were entered for competition.

Speaking generally, I do not consider that this division of the show was a very representative one. The plants and flowers are not of so much importance, perhaps, as the fruits and vegetables, and it is a matter to be regretted that the classes for them were not better filled.

H. E. BYRNE,
Hon. Secretary, Division "B."

REPORT ON DIVISION "C."—STOCK AND DAIRY PRODUCE.

Sections 1 and 2 were cancelled a week before the first day of the Show, owing to the existence of rinderpest in Kuala Lumpur. Section 1 would have had some interesting exhibits, as several Europeans in Selangor and Perak had intended to exhibit.

Section 3 only provided one exhibit in class 1. In classes 2 and 3 there were no exhibits. In the classes for goats, classes 4 and 5, there were four and six exhibits respectively. All the exhibits in these sections, except one from Klang, were from Kuala Lumpur and district, and none of them call for special notice. One prize was awarded in class 1, and two in each of classes 4 and 5.

Two extra prizes were given for sheep.

The Chinamen were backward in bring their pigs, owing to trouble of transporting them, keeping them under restraint, and feeding them on the show ground. The prizes would probably have to be increased in value to induce people to show their pigs, and I doubt whether, even if pigs were exhibited in large numbers, it would prove a great advantage or help on the purposes of the Show.

In section 4, poultry, etc., there was a large number of exhibits. Far ahead of the rest were Mr. FARRER BAYNES' light Brahma fowls. There were many kinds and varieties of fowls exhibited by natives.

In section 5 there were two exhibits of butter, both from Europeans, and several exhibits of eggs.

There were also miscellaneous exhibits which it was found impossible to class under any of the scheduled headings, such as cats, plandoks, birds of various colours and sizes, and a crocodile. These exhibits excite considerable interest among the spectators:

but it should be decided. I think, to keep within the classes scheduled and not to accept miscellaneous exhibits, and clear instructions should be issued to local secretaries on the subject.

Many of the native exhibitors appeared to imagine that deformity in an animal is a special merit, and the mere fact of an exhibit being unique in its gait or the malformation of its limbs entitles it to a prize. There was also an impression that the Judges were to make a daily circuit of the show, awarding fresh prizes on each occasion.

Thanks are due to Messrs. DYKES, R. MEIKLE, E. B. SKINNER and E. F. TOWNLEY for the work they did in arranging the exhibits, and to the two last-named and Mrs. VENNING and Mrs. EPHRAUMS for judging the exhibits. In conclusion, I would recommend that on future occasions prize winners should receive their money prizes on the last day of the Show, as far as possible. This would save a considerable amount of trouble to secretaries I think, and would be very popular among the native prize winners.

T. W. CLAYTON,

Hon. Secretary, Divison "C."

REPORT ON DIVISION "E."—NATIVE INDUSTRIES AND MANUFACTURES.

The section of the Agri-Horticultural Show devoted to Native Industries and Manufactures was certainly by far the largest and probably attracted the greatest attention of any on the ground, its success being almost entirely due to the efforts made by the various District Officers in the Colony and the Federated Malay States to induce the natives to exhibit—by no means an easy matter. The total number of individual exhibits could not have been less than eight or ten thousand, though, of course, this includes series of twenty or thirty objects exhibited under one head.

As might be expected, the bulk of the prizes were carried off by exhibitors from Perak and Negri Sembilan, while a few, chiefly connected with agriculture, were won by Malacca. Selangor exhibits formed a very small proportion of the whole, and Pahang, owing to distance and difficulties of transport, was but poorly represented; nearly every specimen sent by this State, however, was awarded a prize. Special mention should be made of the magnificent exhibit of stamped cloth, *kain telepok*, and silver, from the Kuala Langat district; of the carefully executed series of model fishing boats and nets from Kuantan; of the miscellaneous exhibits of the Kuala Kangsa Art School and the Perak Vernacular Schools; and of the kris sheaths and handles from Upper Perak.

The Show was instrumental in bringing to light numerous implements, etc., now quite obsolete in the Federated Malay States, such as the *gobi api* or fire syringe; but the general impression given was that Malay arts and handicrafts are rapidly becoming obsolete (in the Western States, at any rate) with but little prospect of revival. To take only two instances, the examples of recent silver-work and wood-carving entered were both poor in execution and tasteless and debased in design, showing marked Chinese and Indian influence. Terrible ornaments made of Berlin wool of the most violent analine shades, where the most popular exhibit in the show among the natives, and were eagerly competed for by Chinese, natives of India, and Malays alike.

H. C. ROBINSON,
Hon. Secretary, Division "E."

BALANCE SHEET OF AGRI-HORTICULTURAL SHOW, KUALA LUMPUR, 1905.

As per 24th February, 1905.

LIABILITIES.	$ c.	ASSETS.	$ c.
Awards still unpaid	144 ..	Cash at Chartered Bank ..	141 48
		Balance of Liabilities over Assets	2 52
$	144 ..	$	144 ..

Dr. Profits and Loss Account. *Cr.*

	$ c.		$ c
To Transport	907 79	*By* Government contribution	4,000 ..
,, Buildings..	3,010 12	,, ,, free use of Ptg. Department (say) ..	400 ..
,, General Charges ..	708 13	,, Private Contributions..	2,751 74
,, Printing and Stationery	400 ..	,, Proceeds of gate, etc..	300 ..
,, Compensation	38 50	,, Balance carried forward	2 52
,, Cost of Cups awarded ..	713 72		
,, Money awards	1,676 ..		
$	7,454 26	$	7,454 26

The amount of awards unpaid is based on statements made to me by the General Secretary. No charge was made for printing and stationery, the F.M.S. Government Press having been placed at the Committee's disposal free of charge. No account has been taken sub "Liabilities" of diplomas that at one time it was resolved to issue to prize winners.

KUALA LUMPUR, H. C. E. ZACHARIAS,
24th February, 1905. *Hon. Treasurer.*

Audited and found correct with vouchers and receipts produced.

H. VANE,
7th March, 1905. *Auditor.*

AGRICULTURAL SHOW FOR 1905.

This year's Agri-Horticultural Show is to be held at Penang on the 9th, 10th and 11th of August next. The Prize List has just been published, and copies can be had of the Superintendent of Gardens at Penang, or the Director of Gardens at Singapore, on application. Exhibitors wishing free transport on the railway must give notice to a District Officer or General Secretary, who will, if they approve of their exhibits, provide them with numbered tickets and a free third-class pass on the railway for themselves and their exhibits. A reduction of 25 per cent. off the usual freight will be made by the Steamship Company on all bonâ fide exhibits, other reasonable expenses connected with transport of exhibits will be considered by the Committee.

Entries in all divisions must be made in writing and reach the Secretary at least seven days before the opening day. In the case of horses and dogs three weeks.

The price of admission to the exhibition is two dollars for the opening ceremony the first day, and 20 cents every succeeding day.

Among the additional exhibits for which prizes are offered are Para rubber-seed oil and clove oil, the best collection of varieties of padi grown in any one Mukim and accompanied by an affidavit from the Penghulu that the whole collection was grown in his Mukim during the previous padi season. Para and Rambong rubber not less than 60 lbs. packed as sent from the estate.

Cups are offered as follows:—

For the best exhibit in the Agricultural Produce section by H. E. THE GOVERNOR.

For best sample of rice prepared by machinery by KIM KEK CHUAN.

Best collection of varieties of rice by Hon. A. HUTTENBACH.

Rambong, best sample, by NEGRI SEMBILAN PLANTERS' ASSOCIATION.

Para and Rambong packed for shipment by W. W. BAILEY, ESQ.

Para Rubber free from chemicals, SELANGOR PLANTERS' ASSOCIATION.

Sugar, best refined white; by LIM EOW HONG.
Cannas, 6, presented by Dr. S. KAE.
Table decoration, T. GAWTHORNE, ESQ.
Best collections of fruits, Hon. J. K. BIRCH.
Draught Bulls, pair, A. O. MERICAN.
Bull or Bullock, Peninsula, PENANG CATTLE BUTCHERS.
Buffalo, SYE AH THOON.
Champion animal in Cattle Section, Dr. LOCKE.
Boar, HOKIEN PORK BUTCHERS.
Sow, PIG MARKET DEALERS.
Sow and Litter, AH KOON.
Six pigs, ELTON BELL, ESQ.
Best Pig over 300 catties, CANTONESE PORK BUTCHERS.
Champion Pig, TEAM KEE.
Six Sheep, INDIAN MUTTON TRADING CO.
Sheep (pair), THE PIGDEALERS.
Pair of Turkeys, H. STARR, ESQ.
Best specimen of Native Work, GAN NGOH BEE.
Rubber Machinery, MEMBERS OF ENGINEERS' INSTITUTE.

Also a number of Cups for Horses and Dogs.

Penang has always shown well in cattle and poultry, and we may hope for a good display this time. The fruit crop, at least down South, promises very ill this season, but the Northern part of the Peninsula may be more productive. The remarkable success last year in the Malay arts section, and the subsequent sale of almost everything the natives brought at very good figures, ought to bring as good an exhibition at least. Flowers and ornamental plants too should be much better than at last year's show, where they were remarkably poorly staged, and we shall hope to see a really good exhibition of rubbers, not perhaps better in quality, for that shown last year at Kwala Lumpur was about as good as it could be, but in greater quantity, and more representative of this great industry.

SIR HUGH LOW.

It is with much regret that we have to chronicle the death of one who did so much for agriculture and botany as Sir HUGH LOW, who died on April 18th, 1905, very nearly eighty-one years old.

He was born on May 10th, 1824, and about 1840 obtained an appointment in the Hon. East India Company and travelled out to the East with Mr. (Sir) JOHN BROOKE, which ended in his quickly resigning his Indian appointment and joining the Rajah as secretary. He remained there about three years and then returned to England where he published a well-known work in "*Sarawak, its Inhabitants and Productions.*" In 1848 Mr. Brooke became Acting Governor of Labuan, and Hugh Low accompanied him and became Colonial Treasurer of the Island, whence he visited Lawas and Brunei and made the first ascent of Mt. Kinabalu in 1851, where he collected the grand species of pitcher plants, *Nepenthes Rajah, Lowii, Edwardsianus,* and *villosa.*

He ascended the same mountain again in 1858, and again added much to the knowledge of its flora. During his stay in Borneo indeed he discovered a great number of plants now well known in our Gardens, besides the pitcher plants, among other *Cypripedium Lowii, Vanda Lowii, Coelogyne pandurata,* the fine Rhododendrons of Borneo *R. Brookeanum, R. Lowianum,* and others. So well was he known by the natives to be an enthusiastic collector of plants, that the pretty foliage Orchids *Anoectochilus* and *Haemaria* are known to this day by the Malays as Daun Lo, or Low's leaf.

In 1877 he became Resident of Perak after the murder of Mr. Birch and held the appointment till he retired in 1889. He was created C.M.G. in 1879, K.C.M.G. in 1883, and G.C.M.G. in 1889.

During his residence in Perak he maintained his interest in botany and especially in agriculture. Starting with the Kuala Kangsar Garden where he planted most of the best fruits of the country and introduced the fine naturalized Bornean lemon which is now fairly common in the State. Limau Bali, from the Island of Bali, undoubtedly the best pumoloe, was also introduced by him and is cultivated by many Malays up and down the river. Of useful timbers, Mahogany, Cedrela toona, and Teak were planted and none of economics that were then procurable but what received attention. He was the first to plant *Hevea braziliensis* in the Native States from seeds and plants supplied by the Botanic Gardens, Singapore, and planted at Kuala Kangsar, and from there planted in many parts of the State. The oldest trees on Kamuning Estate and the large tree or two at Lady Weld's bungalow as well as those at S'tiawan were all supplied from the Kuala Kangsar trees. Some stock trees of *Ficus elastica* and *Manihot Glaziovii* were also cultivated in this garden.

Cinchona and coffee were tried at Waterloo and also at the Hermitage, and at the latter garden many excellent English vegetables were successfully grown.

The Cicely garden half way between Lady Weld's bungalow and the Hermitage was planted with tea and liberian coffee and the Gapi's Garden surrounding. Lady Weld's bungalow planted with pepper, liberian coffee and fruits.

Sir Hugh Low also took a great deal of interest in introducing high class cattle, chiefly Jerseys and Alderneys, and Nellore cattle from India, which were kept at Kuala Kangsa and on the Taiping Hills, where the descendants of these cattle still remain to this day.

Men like Sir Hugh Low are, alas, rare. Possessed of a charming personality and an enthusiasm for the development of agriculture in the Peninsula at a time when the importance of this was not appreciated by others he laid the foundation of this great work, and though much of his work was undone or abandoned under later regimes, he will always remain as the pioneer of agriculture in the Malay States.—*Ed.*

RUBBER IN THE MALAY PENINSULA.

Mr. W. D. Bosanquet's letter to the "*Ceylon Weekly Times*" concerning the superiority of the Malay Peninsula as a planting ground for rubber over Ceylon, has caused a storm of indignation on the part of the various correspondents of the Ceylon papers.

Most of the correspondence thus elicited adds nothing to our knowledge of any advantages possessed by Ceylon over the Peninsula. One correspondent points out that Ceylon has a great advantage in possessing a gold standard and fixity of exchange, which the Malay Peninsula has not. It is, however, quite conceivable that this advantage may also be possessed by the Peninsula at no distant date.

Another correspondent writes, under the signature of "Agricola," stating that he has been to the Malay Peninsula, and is most anxious to deter people from going there to plant rubber. On account of the intense heat and deadly climate, whole villages are wiped out by the deadly malaria, and even the Tamil dies. The climate is as bad as West Africa, and so on. This is certainly news to those who have lived and worked healthfully and comfortably in the Malay Peninsula, and have never found out how dangerous a country it is. However, any would-be settlers here who are scared at "Agricola's" appalling account can be reassured by the latest report of the United Planters' Association in which it is proved conclusively that "The death rate on our estates is only 19 per mille against the general death rate of the Indian population of 32.87 per mille; that the birth-rate of planters' free coolies is 24 per mille against the deathrate of 19, and that after the first six months in this country the improvement in physique of the coolies is very marked."

This hardly bears out "Agricola's" statements, and we have no hesitation in stating that such a false description of the healthiness of the country should never have been published, and still less have been reprinted in a local Singapore paper as it has been.

RUBBER SEED.

As we are constantly receiving requests for supply of rubber seed for planting in various parts of the world, notably Ceylon, India and the Archipelago, and as the Gardens seed crop is fully booked a long way ahead this year, planters who would like to dispose of their overplus of seed this year could inform the Director of Gardens, Singapore, who would put them in communication with others desiring the seed. Price of seed and details necessary should be given.—*Ed.*

RUBBER FROM THE MICHIE MACHINE.

Since the remarks on the Ceylon Rubber Machine in this number of the "*Bulletin*" were printed, we have received in the "*Ceylon Weekly Times*" a report of the sale of some of the prepared product, which we extract:—

"The Rubber market is firm. The price of Para is 5*s.* 9*d.* Straits sheet rubber sold on the 18th instant fetched 6*s.* 9*d.* A small lot of last week's crepe rubber has been resold at 6*s.* 10½*d.* Samples of the new strip or "Worm" rubber believed to have been prepared by the Michie process are well thought of. A hundredweight was sold at Liverpool recently at 6*s.* 6*d.* It is now worth more." (*London, May* 19*th*).

SINGAPORE MARKET REPORT.

May, 1905.

Articles.	Quantity Sold.	Highest Price.	Lowest Price
	Tons.	$	$
Coffee—Palembang	...	31.00	31.00
Bali	110	22.00	20.25
Liberian	117	26.00	22.50
Copra	6,400	8.40	7.65
Gambier	3,600	8.85	8.57½
Cube Gambier, Nos. 1 & 2	338	13.00	12.00
Gutta Percha, 1st quality	...	200.00	150.00
Medium	...	100.00	90.00
Lower	...	80.00	19.00
Borneo Rubber, 1st, 2nd, & 3rd	...	140.00	90.00
Gutta Jelotong	...	7.87½	7.50
Nutmegs, No. 110's	...	34.00	33.00
No. 80's	...	57.00	56.00
Mace, Banda	...	80.00	80.00
Amboyna	...	59.00	54.00
Pepper, Black	1,640	26.37½	25.50
White (Sarawak)	322	37.75	36.50
Pearl Sago, Small	25	4.75	3.80
Medium	5	4.50	4.50
Large	...	5.50	5.50
Sago Flour, No. 1	3,890	3.25	3.12½
No. 2	300	.96	.80
Flake Tapioca, Small	464	4.55	4.30
Medium	50	4.60	4.55
Pearl Tapioca, Small	810	4.55	4.30
Medium	535	4.40	4.15
Bullet	65	5.70	5.50
Tin	3,290	80.87½	79.00

* Closing fair

Export Telegram to Europe and America.

Fortnight ending 15th May, 1905.

			To.	Tons.
Tin	Str	Singapore & Penang	U. Kingdom &/or	1550
Do	,,	do	U. S. A.	550
Do	,,	do	Continent	205
Gambier	,,	Singapore	Glasgow	—
Do	,,	do	London	—
Do	,,	do	Liverpool	150
Do	,,	do	U. K. &/or Continent	10
Cube Gambier	,,	do	United Kingdom	35
Black Pepper	,,	do	do	45
Do	,,	Penang	do	30
White Pepper	,,	Singapore	do	50
Do	,,	Penang	do	—
Pearl Sago	,,	Singapore	do	35
Sago Flour	,,	do	London	100
Do	,,	do	Liverpool	1600
Do	,,	do	Glasgow	125
Tapioca Flake	,,	Singapore & Penang	United Kingdom	270
T. Prl. & Bull.	,,	do	do	410
Tapioca Flour	,,	Penang	do	420
Gutta Percha	,,	Singapore	do	40
Buffalo Hides	,,	do	do	100
Pineapples	,,	do	do	11,000 cases
Gambier	,,	do	U. S. A.	550
Cube Gambier	,,	do	do	70
Black Pepper	,,	do	do	90
Do	,,	Penang	do	120
White Pepper	,,	Singapore	do	30
Do	,,	Penang	do	—
T. Flake & Pearl	,,	Singapore & Penang	do	650
Nutmegs	,,	do	do	41
Sago Flour	,,	Singapore	do	—
Pineapples	,,	do	do	4750
Do	,,	do	Continent	2500
Gambier	,,	do	South Continent	50
Do	,,	do	North do	175
Cube Gambier	,,	do	Continent	10
Black Pepper	,,	do	South Continent	220
Do	,,	do	North do	80
Do	,,	Penang	South do	30
Do	,,	do	North do	—
White Pepper	,,	Singapore	South do	15
Do	,,	do	North do	40
Do	,,	Penang	South do	10
Do	,,	do	North do	—
Copra	,,	Singapore & Penang	Marseilles	780
Do	,,	do	Odessa	—
Do	,,	do	Other S. Continent	340
Do	,,	do	North Continent	1025
Sago Flour	,,	do	Continent	825
Tapioca Flake	,,	do	do	100
Tapioca Pearl	,,	do	do	130
Copra	,,	Singapore	England	—
Gambier	Slr	do	U. S. A.	—
Cube Gambier	,,	do	do	—
T. Flake & Pearl	,,	do	do	—
Sago Flour	,,	do	do	—
Gambier	,,	do	South Continent	—
Copra	,,	do	Marseilles	—
Black Pepper	,,	do	South Continent	—
White Pepper	,,	do	do	—
Do	,,	do	U. S. A.	—
Pineapples	,,	do	do	—
Nutmegs	,,	do	do	—
Black Pepper	,,	do	do	—
Do	,,	Penang	do	—
White Pepper	,,	do	do	—
T. Flake & Pearl	,,	do	do	—
Nutmegs	,,	do	do	—
Gambier		Contractors		1950
Black Pepper				525

Export Telegram to Europe and America.

Fortnight ending 31st May, 1905.

		To.	Tons.
Tin	Str Singapore & Penang	U. Kingdom &/or	1226
Do	,, do	U. S. A.	635
Do	,, do	Continent	493
Gambier	,, Singapore	Glasgow	—
Do	,, do	London	25
Do	,, do	Liverpool	—
Do	,, do	U. K. &/or Continent	325
Cube Gambier	,, do	United Kingdom	10
Black Pepper	,, do	do	75
Do	,, Penang	do	50
White Pepper	,, Singapore	do	80
Do	,, Penang	do	—
Pearl Sago	,, Singapore	do	25
Sago flour	,, do	London	85
Do	,, do	Liverpool	—
Do	,, do	Glasgow	75
Tapioca Flake	,, Singapore & Penang	United Kingdom	220
T. Prl. & Bull.	,, do	do	90
Tapioca Flour	,, Penang	do	150
Gutta Percha	,, Singapore	do	65
Buffalo Hides	,, do	do	65
Pineapples	,, do	do	10,500 cases
Gambier	,, do	U. S. A.	975
Cube Gambier	,, do	do	100
Black Pepper	,, do	do	240
Do	,, Penang	do	30
White Pepper	,, Singapore	do	35
Do	,, Penang	do	—
T. Flake & Pearl	,, Singapore & Penang	do	325
Nutmegs	,, do	do	14
Sago flour	,, Singapore	do	
Pineapples	,, do	do	2250
Do	,, do	Continent	2500
Gambier	,, do	South Continent	25
Do	,, do	North do	400
Cube Gambier	,, do	Continent	65
Black Pepper	,, do	South Continent	175
Do	,, do	North do	150
Do	,, Penang	South do	10
Do	,, do	North do	—
White Pepper	,, Singapore	South do	—
Do	,, do	North do	20
Do	,, Penang	South do	10
Do	,, do	North do	10
Copra	,, Singapore & Penang	Marseilles	760
Do	,, do	Odessa	1325
Do	,, do	Other S. Continent	—
Do	,, do	North Continent	2200
Sago Flour	,, do	Continent	430
Tapioca Flake	,, do	do	150
Tapioca Pearl	,, do	do	480
Copra	,, Singapore	England	—
Gambier	Slr do	U. S. A.	—
Cube Gambier	,, do	do	—
T. Flake & Pearl	,, do	do	—
Sago Flour	,, do	do	—
Gambier	,, do	South Continent	—
Copra	,, do	Marseilles	—
Black Pepper	,, do	South Continent	—
White Pepper	,, do	do	—
Do	,, do	U. S. A.	—
Pineapples	,, do	do	—
Nutmegs	,, do	do	—
Black Pepper	,, do	do	—
Do	,, Penang	do	—
White Pepper	,, do	do	—
T. Flake & Pearl	,, do	do	—
Nutmegs	,, do	do	—
Gambier	Contracts		1600
Black Pepper			1100

Kelantan.

Abstract of Meteorological Readings taken at the Duff Development Concession, Ltd., Kelantan, for the month of May, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
				Mean. °F	Mean. °F	Mean. °F						Ins.	Ins.
Kuala Lebir	...	...	...	90.2	71.6	18.6	...	...	...	...	...	5·93	1·97
Ulu Liang	...	...	...	89.0	72.5	16.5	...	...	...	...	...	8.80	1·34
Kuala Kelantan ...	...	...	...	86.8	74.0	12.7	...	...	...	...	...	7·09	1·57
Serasa	...	...	...	89.1°	71.5	17.5	...	...	...	...	...	9.84	3·21

Surgeon's Office,
6th June, 1905.

JOHN D. GIMLETTE,
Surgeon.

Malacca.

Abstract of Meteorological Readings in the various Districts of the State for May, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Durian Daun Hospital	22.819	153.4	83.2	88.2	75.6	12.6	80.5	1.007	72.1	88	E	4.15	1.35

COLONIAL SURGEON'S OFFICE,
MALACCA, 12*th June*, 1905.

F. B. CROUCHER,
Colonial Surgeon.

Muar.

Abstract of Meteorological Readings for May, 1905.

District	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
			°F.	°F.	°F.	°F.	°F.					Ins.	Ins.
Lanadron Estate	..	..	81	91	72	19	74	..	..	..	..	5.51	2.06

Muar, 13*th June*, 1905. ROGER PEARS.

Penang.

Abstract of Meteorological Readings for May, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	°F	%		Ins.	Ins.
Criminal Prison Observatory ...	29.900	143.4	79.8	89.5	74.2	15.3	75.6	77.7	71.46	70	N.W.	6.58	1.68

C. MUGLISTON,
Colonial Surgeon, Penang.

Penang, *9th June*, 1905.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for May, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall in 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping ...	...	149	81.72	92	72	20	77·98	911	...	84	...	14.69	2.10
Kuala Kangsar...	...	...	80.52	92	72	20	76.56	861	...	83	...	8.94	1.90
Batu Gajah ...	...	155	81.27	93	69	24	77·63	900	...	85	...	10.30	2.15
Gopeng ...	...	...	80.06	93	63	30	76.40	863	...	85	...	10.91	1.64
Ipoh ...	...	...	80.96	93	71	22	77·43	894	...	85	...	11.60	1.63
Kampar ...	...	...	...	...	70	...	...	...	...	...	...	13·36	2.43
Telok Anson ...	...	...	80.80	92	73	19	75·37	809	...	77	...	11.75	3.69
Tapah ...	...	...	81.12	93	71	22	77.00	874	...	83	...	14.26	1.50
Parit Buntar ...	...	...	82.65	91	65	26	77·78	888	...	80	...	6.59	1.10
Bagan Serai ...	...	...	82.62	92	71	21	77.92	895	...	80	...	6.31	1.30
Selama ...	...	...	81.94	91	73	18	78.15	914	...	84	...	14.18	2.22

STATE SURGEON'S OFFICE,
21st *June*, 1905.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for May, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29.878	147.6	79.4	89.8	71.9	17.9	76.3	0.845	74.2	84	Calm	14.60	2.15
Pudoh Gaol Hospital ,,	..	..	..	..	..	..	..	..	..	..	..	16.21	2.86
District Hospital ,,	..	..	..	..	..	..	..	..	..	..	..	12.03	2.10
,, Klang	..	..	..	88.0	70.8	17.2	..	..	..	..	..	16.36	2.38
,, Kuala Langat	..	..	..	87.6	74.2	13.4	..	..	..	..	..	6.58	1.67
,, Kajang	..	..	..	91.3	73.3	18.0	..	..	..	..	..	21.54	3.64
,, Kuala Selangor	..	..	..	87.5	75.0	12.5	..	..	..	..	..	7.75	2.30
,, Kuala Kubu	..	..	..	91.5	72.1	19.4	..	..	..	..	..	19.11	3.63
,, Serendah	..	..	..	91.0	75.9	15.1	..	..	..	..	..	13.69	3.92
,, Rawang	..	..	..	89.9	71.3	18.6	..	..	..	..	..	16.47	2.60
Beri-beri Hospital, Jeram	..	..	..	..	..	..	..	..	..	..	..	6.82	1.73
Sabah, Bernam	..	..	..	..	..	..	..	..	..	..	..	8.47	1.25

State Surgeon's Office,
Kuala Lumpur, *20th June*, 1905.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Singapore.

Abstract of Meteorological Readings for May, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Kadang Kerbau Hospital Observatory ...	29.886	136.9	81.2	89.9	74.7	15.2	78.6	.912	76.9	81.	S.S.E. S.W.	9.36	2.79

D. K. McDOWELL, *P.C.M. Officer.*

A. B. LEICESTER, *M.D.*

Surgeon's Office, 21*st June*, 1905.

Register of Rainfall at Negri Sembilan Hospitals for May, 1905.

Date	Seremban.		K. Pilah.		Tampin.		Jelebu.		Port Dickson.		Mantin.	
	Inches	dcs.	Inches	dcs.	Inches	dcs.	Inches	dcs.	Inches	dcs.	Inches	dcs.
1	..	11	..	..	..	..	..	..	..	12	..	08
2	..	35	..	15	..	..	..	07	..	..	1	28
3	..	..	..	..	..	..	..	35	..	..	..	..
4	1	55	..	18	..	..	..	..	..	..	1	37
5	2	23	..	39	..	62	2	15	..	76	..	57
6	..	..	..	..	..	..	..	25	..	..	..	71
7	..	..	..	..	..	..	..	..	..	..	..	..
8	..	..	..	..	..	..	..	01	..	..	..	..
9	..	..	..	..	1	47	..	..	..	..	..	..
10	..	36	..	..	..	..	..	..	..	15	1	87
11	..	..	..	..	..	20	..	..	1	17	..	..
12	..	22	1	07	..	24	..	90	..	52	..	19
13	..	63	..	..	..	..	..	..	2	50	..	17
14	..	75	..	..	..	10	..	27	..	..	2	10
15	..	51	..	..	..	13	..	28	2	21	..	39
16	..	93	..	40	..	..	..	04	2	16	..	02
17	..	25	..	22	..	45	..	44	..	24	..	01
18	..	04	..	07	..	20	1	30	..	..	..	07
19	..	86	..	54	..	..	..	65	..	19	..	24
20	2	04	..	90	..	28	..	42	..	..	1	30
21	..	..	..	13	..	85	.	43	1	55	..	41
22	..	..	..	..	..	50	..	01	..	..	..	03
23	..	57	..	60	..	..	1	07	..	..	..	..
24	..	52	..	07	..	..	..	..	..	34	..	63
25	..	..	..	..	2	00	..	..	..	11	..	17
26	..	..	..	06	..	..	..	..	..	..	..	..
27	..	13	1	35	..	..	..	14	..	..	..	..
28	..	78	..	..	..	..	2	20	..	72	2	19
29	..	09	..	..	..	..	..	..	..	..	..	..
30	..	..	..	..	..	..	..	..	..	..	..	..
31	..	..	..	..	..	..	..	75	..	..	..	13
Total	12	92	6	13	7	04	11	73	12	74	13	93

STATE SURGEON'S OFFICE, SEREMBAN,
13*th June*, 1905.

R. VAN GEYZEL,
Apothecary.

Meteorological Observations.

Table showing the daily results of the reading of Meteorological Observations taken at the General Hospital, Seremban, for the month of May, 1905.

Date.	Temperature of radiation. 9 H	Temperature of radiation. 15 H	Temperature of radiation. Mean.	Temperature of radiation. Maximum.	Temperature of radiation. Minimum.	Temperature of radiation. Range.	Temperature of radiation. Sun.	Temperature of radiation. Difference sun and shade.	Temperature of radiation. Grass.	Temperature of radiation. Difference shade and radiation.	Wind. Direction. 9 H	Wind. Direction. 15 H	Temperature of evaporation. 9 H	Temperature of evaporation. 15 H	Temperature of evaporation. Mean.	Computed vapour tension. 9 H	Computed vapour tension. 15 H	Computed vapour tension. Mean.	Relative humidity. 9 H	Relative humidity. 15 H	Relative humidity. Mean.	Clouds 0 to 10. 9 H	Clouds 0 to 10. 15 H	Clouds 0 to 10. 21 H	Cloud and weather initials. 9 H	Cloud and weather initials. 15 H	Cloud and weather initials. 21 H	Rain. Inches.
	°	°	°	°	°	°	°	°	°	°			°	°	°	in.	in.	in.	°	°	°							
1	79	87	83	88	74	14	142	54	...	...	S.E.	E.	73.9	71.1	75.5	.839	.933	.886	85	73	79	3	3	2	C	C	B	.11
2	78	87	82.5	87	74	13	142	55	...	...	E.	E.	74.6	70.6	72.6	.857	.749	.803	89	58	73.5	0	3	3	B	C	C	.35
3	78	87	82.5	87	73	14	145	58	...	...	S.E.	S.E.	74.6	72.2	73.4	.857	.792	.824	89	61	75	0	3	0	B	C	B	
4	78	79	78.5	89	76	13	155	66	...	...	S.E.	E.	74.6	75.6	75	.857	.888	.872	89	90	89.5	5	10	10	C	R	R	1.55
5	80	76	78	89	74	15	148	59	...	...	N.E.	N.E.	73.3	74.3	73.8	.820	.848	.834	80	94	87	5	10	3	C	R	C	2.23
6	77	87	82	88	72	16	143	55	...	...	N.E.	S.	75.3	77.1	76.2	.877	.933	.905	94	73	83.5	0	3	2	B	C	B	
7	80	88	84	89	74	15	147	58	...	...	S.E.	S.E.	75	76.5	75.7	.876	.913	.890	85	69	77	0	0	0	B	B	B	
8	80	86	83	89	74	15	157	68	...	...	S.E.	S.E.	73.3	77	75	.820	.955	.887	80	76	78	0	0	0	B	B	B	
9	83	79	81	88	74	14	125	37	...	...	E.	S.E.	74.7	75.6	75	.856	.888	.872	76	90	83	0	3	2	B	C	B	
10	81	83	82	88	74	14	158	70	...	...	S.E.	S.E.	74	78	76	.849	.956	.902	80	85	82.5	0	0	0	B	B	B	.36
11	81	82	81.5	86	74	12	137	51	...	...	S.E.	S.E.	76	77	76.5	.897	.926	.911	85	85	85	0	3	0	B	C	B	
12	79	85	82	87	74	13	130	43	...	...	S.E.	S.E.	75.6	75	75.3	.888	.873	.880	90	72	81	0	5	10	B	C	R	.22
13	79	80	79.5	80	76	4	97	17	...	...	E.	S.E.	75.6	75	75.3	.888	.867	.877	90	85	87.5	3	3	5	C	C	C	.63
14	81	86	83.5	86	73	13	152	66	...	...	S.E.	S.	74	72.8	73.4	.849	.808	.828	80	64	72	3	0	0	C	B	B	.75
15	78	79	78.5	85	74	11	137	52	...	...	S.E.	N.E.	74.6	77.3	75.9	.857	.937	.897	89	95	92	3	10	5	C	R	C	.51
16	79	76	77.5	85	73	12	148	63	...	...	N.E.	N.E.	75.6	74.3	74.9	.888	.848	.868	90	94	92	2	10	2	B	R	B	.93
17	79	84	81.5	88	74	14	153	65	...	...	E.	E.	75.6	75.7	75.6	.888	.888	.888	99	76	83	2	10	5	B	R	C	.25
18	77	85	81	86	74	12	151	65	...	...	E.	S.	75.3	75	71.1	.877	.873	.875	94	72	83	0	3	2	B	C	B	.04
19	82	78	80	87	75	12	150	63	...	...	S.E.	S.E.	75.3	76.3	75.8	.877	.906	.891	80	94	87	0	10	3	B	R	C	.86
20	77	84	80.5	84	74	10	110	26	...	...	S.E.	E.	73.6	74	73.8	.829	.840	.834	89	72	80.5	3	0	10	C	B	R	2.04
21	73	78	75.5	79	73	6	89	10	...	...	N.E.	E.	71.3	76.3	73.8	.766	.906	.836	94	94	94	10	5	5	R	C	C	
22	74	80	77	84	73	11	110	26	...	...	N.E.	E.	70.5	75	72.7	.748	.867	.807	89	85	87	3	5	5	C	C	C	
23	77	76	76.5	87	73	14	150	63	...	...	E.	S.E.	73.6	74.3	73.9	.829	.848	.838	89	94	91.5	5	10	5	C	R	C	.57
24	76	76	76	83	73	10	148	65	...	...	S.E.	N.W.	72.6	74.3	73.4	.801	.848	.824	89	94	91.5	3	10	5	C	R	C	.52
25	78	78	78	84	73	11	141	57	...	...	N.W.	N.E.	72.9	72.9	72.9	.810	.810	.810	84	84	84	0	10	2	B	R	B	
26	81	87	84	87	72	15	149	62	...	...	E.	S.E.	70.9	73.9	72.4	.757	.837	.797	72	65	68.5	0	0	0	B	B	B	
27	82	85	83.5	89	74	15	156	67	...	...	S.E.	S.E.	73.6	76.7	75.1	.830	.922	.876	76	76	76	0	3	3	B	C	C	.13
28	83	76	79.5	87	75	12	152	65	...	...	N.E.	N.E.	76.3	74.3	75.3	.905	.848	.876	80	94	87	0	10	10	B	R	R	.78
29	76	86	81	87	72	15	152	65	...	...	S.E.	S.E.	72.6	74	73.3	.801	.855	.828	89	68	78.5	0	0	0	B	B	B	.09
30	80	84	82	87	72	15	144	57	...	...	S.E.	S.E.	75	79	77	.867	.990	.928	85	85	85	0	10	5	B	R	C	
31	80	87	83.5	88	74	14	154	66	...	...	S.E.	S.E.	76.6	75.5	76	.916	.884	.900	90	69	79.5	0	3	5	B	C	C	

TOTAL ... 12.92

STATE SURGEON'S OFFICE, SEREMBAN,
9th *June*, 1905.

R. VAN GEYZEL,
Apothecary.

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1905.

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AGRICULTURAL BULLETIN
OF THE
STRAITS
AND
FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua- "tion regarding new or little known natural or manufactured pro- "ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.

AGRICULTURAL BULLETIN
OF THE
STRAITS
AND
FEDERATED MALAY STATES.

No. 7.] JULY, 1905. [VOL. IV.

NOTES ON THE COLLECTION OF AROIDS CULTIVATED IN THE BOTANIC GARDENS, SINGAPORE.

AROIDS.

Cultivation.—Aroids, as cultivated plants, are chiefly known as ornamental foliage plants, and as such many are very popular among horticulturists. Especially useful as pot plants for the house and verandah with their noble foliage, sometimes beautifully variegated, and usually very easy of cultivation, some at least are to be found in all gardens of the East. A smaller number belonging to the genera *Colocasia*, *Alocasia*, *Xanthosoma* and *Amorphophallas*, are commonly cultivated by natives for their edible tubers or rhizomes and two at least *Colocasia antiquorum* and the aquatic *Pistia stratiotes* form a large part of the food of the Chinese pig, for which they are largely cultivated.

The grassy leaved Jeringu or Sweet Flag, *Acorus Calamus,* a native of the North temperate region, which has been widely spread all over the world, is cultivated in most villages for its aromatic rhizome, formerly in great repute as a drug, and still an important article of the native Pharmacopœia. It is cultivated in ditches or damp spots, and grows very readily. It seldom produces flower here, but on one occasion, I found a number of plants producing the thick spike of green flowers, from the leaf-like flat stem.

AQUATIC AROIDS.

These aroids require to be grown entirely in water either in a tank, where the water from time to time is changed, or in a pool or slow-running stream. The following are the chief kinds:—*Cryptocoryne*, small aquatic aroids, with floating leaves (except one species) usually found in masses in forest streams. The spathes have long tubes, which rise to the surface, and project above it ending in a more or less tailed purple or yellow limb. They are chiefly botanically interesting from the curious valve at the bottom of the tube above the flower spike which allows of the entrance of minute flies which fertilize the flowers, but prevents the entrance of water. Several species occur in the forests of the Peninsula. *C. ciliaris* differs in its erect fleshy leaves, and is a tidal mud plant very common in the muddy streams and rivers near the sea. Although it almost invariably grows in salt mud in a wild state, it grows well in fresh water in the gardens. These plants not only can be raised from seed, but also produce long suckers by which they can be reproduced.

Lagenandra is a plant of similar habit from Ceylon.

Pistia stratiotes, the water lettuce "Kambiang or Kiambang" of the Malays, is a curious floating plant with bright green leaves, in a rosette, largely cultivated by the Chinese in ponds for feeding pigs. It propagates itself rapidly by means of suckers, and is a popular plant in many places for aquariums.

Lasia spinosa, *Cyrtosperma lasioides* and *Aglaonema Griffithii* are also aroids which require to be grown in water. All are natives of the Peninsula. The first two have thorny stems and petioles. *Lasia* has finely-cut leaves and a curious long purple spathe, *Cyrtosperma* has large heart-shaped leaves. They are propagated easily from seed or cuttings of the stems.

TUBEROUS AROIDS.

To this group belong *Arisaema*, *Typhonium*, *Amorphophallus*, *Hapaline*, *Caladium*, *Anchomanes* and *Dracontium*. The stems are reduced to subterranean tubers which, during growth, throw off laterally other small tubers from which they can be propagated. The plants are grown in pots or tubs, and the tubers when planted soon throw up a shoot from the centre, which develops into leaves and flower spikes sometimes simultaneously. In other cases, the leaves appear first, one by one in *Amorphophallus*, and then the leaf falls and the inflorescence is produced. There are several kinds of *Arisaema* to be found in the hill districts of the Peninsula. They are commonly known as Cobra flowers, from the hooded spathe suggesting the hood of a cobra. The most popular is *Arisaema fimbriatum* from the Lankawi Islands with large trifoliate leaves and a purple-striped spathe, with a long purple-plumed spadix.

The *Typhoniums* are garden weeds with entire or lobed leaves and large or small purple or yellow spathes.

The *Amorphophalli* are worth cultivating not only for their striking foliage, but also from their extraordinary inflorescence. The tubers are often of immense size, those of *A. Prainii* and *A. Rex* being often a foot through and that of *A. Titanum* very much larger. Each tuber, which is rounded with a depression on the top, throws up a single leaf, which in large plants attains a height of 6 feet or more. The leaf stalk in *A. Prainii* and some others is mottled with white dark and light green and grey, and is often 2 or 3 inches thick and quite succulent; from its mottled coloring, these plants have received the name of Python plants. In *A. Rex* and other species the leaf stalk is dark green and rough. The blade of the leaf is finely cut up into leaflets, and is often several feet across. Large tubers usually give large leaves and large inflorescence, but even small ones will flower though the spike is smaller; after lasting for some time, the leaf withers and falls. It is then cut off and the tuber is allowed to dry in the pot till another shoot appears in the centre, when it is watered. The tuber usually throws up thus leaf after leaf, but sooner or later instead of the leaf an inflorescence is produced. Usually, if the leaf withers gradually, it is followed by another leaf, if it falls over very suddenly an inflorescence may be expected. This is borne on a short thick stalk and consists of a spathe with a tubular base and a broad spreading limb, from the centre of which rises the flower spike topped by a conic or elongate barren portion often of remarkable form. In *A. Prainii*, the commonest species in the Peninsula, the spathe is lemon-yellow or ivory-white with the tubular part inside deep-purple, the spadix yellow with a thick yellowish white cone. *A. Rex* has spathe and spadix of a dark reddish-brown. *A. Titanum* is an enormous species with a spadix sometimes as much as five feet tall, dark-purple, the spathe being green and purple, while the stem reaches tree-like dimensions. In nearly all the species the inflorescence emits at first a horrible odour of putrid meat which goes off in a few hours. The inflorescence lasts for three or four days and then withers away.

Anchomanes and *Dracontium* are plants of the same style as *Amorphophallus*; they have never flowered here. *Hapaline* is a rather insignificant little round-leaved plant with a slender whitish spathe and very small tubers. The species are natives of Indo-Siam.

The most popular, however, of all the tuberous aroids are the *Caladiums*. These are natives of South America, but, being spread over the world as cultivated plants, often appear in waste ground and other places as if they were wild; most of the cultivated forms are hybrids of *C. bicolor* and *C. marmoratum* and *C. picturatum*, besides which there is the small-leaved white and green-leafed plant commonly known as *C. argyrites* (*C. Humboldtii*). All the best hybrids are obtained from European nurseries and tubers of the newest and best kinds are expensive, but all can be grown in the Straits with due care and, indeed, both in Penang and Singapore there are a few very fine private collections.

Freshly imported tubers should be inspected for decay or mould which should be thoroughly cleaned off and the tuber dusted with powdered charcoal and regularly inspected until sufficiently sprouted to be potted. It is well, when potting, to fill the pots with a prepared compost of well-rotted manure, leaves, a little good loam, some burnt earth and sand; fill the pot with the compost, make a hole for the tuber which should be filled with sand, or if an unsound tuber charcoal, press moderately firm and keep in a cool shaded place. The soil is usually fairly damp, and it is not necessary to water until a few freshly made roots are seen; then the plants will require water, sparingly at first, and as the plants grow more light, keep growing quickly by giving more water and light and when strong enough pot into larger pots according to size of tuber. To obtain well-coloured leaves with all the spots, lines and colours prominent, the plants must be gradually exposed, but care must be taken that the leaves are not "wilted or caught" by the sun.

As the plants gradually mature and become "past," they should be removed to a dry place and the watering reduced and finally dried off and rested in the pots as they stand. The tubers may remain dormant for three months; it is necessary to occasionally inspect them as the pots should not be dust dry and as the tubers sprout, repeat the treatment as before. This is the time that the different sorts may be increased by dividing the tubers. With some varieties, this is not possible for two or more years, but nearly all admit of some division. It is assumed that only the freshly made tubers will be removed, which is really an advantage; it is of course possible to cut or break up the old tuber as is done with a potato, but that means a weakened plant.

EDIBLE AROIDS.

Among the aroids cultivated in many parts of the world, one of the commonest is *Colocasia antiquorum*, now widely dispersed in all parts of the world warm enough for it. Probably a native of India, it has ovate peltate leaves, usually light green, but there are also several pretty forms with blotches of purple or black on the leaves and stalks such are the varieties *Fontanesii* and *Illustris*. It is chiefly cultivated for pig food by the Chinese, but the long shoots are also eaten by natives, boiled with tamarinds. It is known by the Malays as "Keladi Babi;" other varieties are "Keladi Lilin," and "Keladi Serakit."

The Malay name "Keladi" corresponds with the West Indian and South American "Tania" and "Eddoes" and includes all the edible tubers and rhizomes mentioned in the list appended.

In the Malay Peninsula, edible aroids are most easy of cultivation and they even often survive in suitable places as naturalised plants.

Xanthosomas are plants with large cordate leaves on long stalks, of quite the habit of the big *Alocasias*. but are natives of South America. *X. Lindenii*, with its white-striped leaves, has long been a popular decorative plant. *X. violacea* and *X. robusta* are cultivated for their edible rhizomes.

X. violacea is known as "Keladi Kelamino."

ORNAMENTAL AROIDS.

Besides those previously mentioned, as worth cultivating for their beauty, we have a large number of handsome plants, often easily grown in pots, or on rockeries, which are very popular.

Homalomenas, common in our forests, are an easy group of cultivation. The large ones have heart-shaped or arrow-shaped leaves, of a rich green. The most popular is *H. Singaporensis* with bright red leaf stalks. Its home is not known, but it is certainly not a native of Singapore.

The smaller *Homalomenas* (*Chamaecladons*) are often very prettily marked with silver blotches on the leaves, or the leaves may be dark red. They are best grown in pans The prettiest variegated ones come from the limestone rocks of Borneo. *Curmeria Wallisii* of South America is easy to grow in the same way, and is popular from its broad leaves mottled with light and dark green and red leaf stalks.

Schizmatoglottis is a genus of aroids of the same style as *Homalomena*, and as easy to grow; some of the species have the leaves spotted with light green or yellow or silver, or with a central silver feather, or are otherwise prettily marked; all are Malayan and some pretty species are abundant in our woods.

Alocasias are always admired for their bold heart-shaped or oval often metallic looking leaves. The common species here, *A. denudata*, "Keladi Ular," is very variable, and a number of varieties have received names. It grows in hedge banks and woods everywhere, the leaves are narrowly arrow-shaped (*A. longiloba*) ovate (*A. Curtisii*) or broadly arrow-shaped, the common form *denudata*, usually dark green above, paler beneath, with the nerves of a lighter colour; there are forms with silvery main nerves, and also with all the reticulation silvery (*A. Thibautiana*), or with the back of the leaf deep purple. This latter form is not always easy to tell from *A. Lowii* but in *A. denudata*, the petiole is always clouded, while in *A. Lowii*, it is light green.

A. Lowii is a limestone rock plant growing in Borneo, and in Perak, Selangor, etc. It often attains a great size and superb plants are often on view at our exhibitions. The Perak form, with the basal lobes meeting and joining more than in the typical Borneo form, is known as *A. Lowii grandis*.

A. denudata and its variable varieties include some fine forms, one of the *A. longiloba* in the Singapore Gardens is finely marked, and the graceful recurved leaf is about 2′ 6″ long, equally striking too is its prettily mottled leaf stalk. This form compares with *A. Lowii* in appearance as does *Anthurium warocqueanum*, with *Anthurium crystallinum*.

Alocasia Sanderiana and *A. cuprea* do not grow well in Singapore and require a good deal of care, *A. Villeneuvii* and *A. ovalifolium* are bold green-leaved plants, acceptable in the Singapore collection although poor in comparison with the deeply coloured and finely marked species.

Schizocasia Portei and *Xanthosoma Lindenii*, are both well known in and about the Straits as Exhibition plants and occasionally some remarkable fine specimens may be seen.

Philodendrons, are New World plants, epiphytes, or, as the name implies, lovers of trees, and when unrestricted attain lofty heights; all the species are attractive, with some the leaves are cut into deep segments, some are finely variegated, others are green-leaved with bright coloured stipules, but with a little trouble most of the species can be grown as pot or tub plants, on trellis or baloon for the smaller species, in pots or tubs for the larger ones with a duplicate pot or tub ready as the host becomes too large for the reception of the climbing offspring, a large rosette of leaves with the decorative species. In this way, *P. giganteum, P. Mamei* and another similar aroid, *Monstera deliciosa,* as well as some of the *Rhaphidophoras,* are regularly grown in the Singapore Gardens.

Anthuriums are beautiful plants; some have velvet-looking leaves with a fine metallic lustre, others are equally striking for their highly coloured flower bracts, perhaps the best known example of this genus in the Straits is *A. crystallinum.* The Singapore collection includes one or two fairly good hybrids raised in the Gardens. Nearly all the species are of easy culture and are easy to propagate, a few from seeds, others from joints of the stem. Ordinary soil without any manure and plenty of gritty matter with pieces of charcoal, bricks, and abundant drainage is all that is necessary; in fact, if kept well watered and sufficiently shaded, our climate will do the rest. A few species, *A. Scherzerianum, A. Andreanum, A. Veitchii* require more careful treatment.

Dieffenbachias, Aglaonemas and *Homalomenas* of some kinds are grown in all gardens in the tropics, either as pot plants or in the shrubberies; all are very easy of culture and grow fast in rich soil. In most of these three genera, the plant eventually produces an erect or more or less erect stem, by which it can be easily propagated, the stem being cut into joints and planted in a pan of sandy soil when the segments will soon send up fresh shoots. *Aglaonema costatum* and *siamense* have creeping rhizomes, which can be broken up, and some of the *Homalomenas* bud off laterally so as to be easily propagated.

The *Dieffenbachias* with their noble green leaves often mottled with lighter green or white are natives of South America. The *Aglaonemas* are Malayan. These plants are very suitable for house decoration as they stand the dryness of the air and dust better than most plants. *Aglaonema costatum,* a low growing form with deep black green leaves spotted with white, or with a central white bar, was discovered by Mr. CURTIS, in the Lankawi Islands, and is a very popular plant, as it grows with great rapidity, soon filling a good sized pan and standing the discomforts of house-life and even of ship-life very well, and always looking handsome.

Aglaonema commutatum, Haenkei and *oblongifolium* especially the finely white-striped variety, *Curtisii,* from Penang Hill, are taller plants, of easy culture, either in pots or on rockeries or in shady parts of the garden.

Among cultivated aroids in the Straits, the great desideratum is the so-called Arum lily (*Richardia africana*). On the plains, these fine decorative plants are a failure and indeed at 5,000 feet merely exist, although the yellow-spathed *R. Elliotiana* might do better; their loss, however, is compensated for in the handsome leaves, bright bracts and remarkable stems of many species of the appended list, which are perhaps more easily cultivated in the Straits than many other parts of the tropics.

LIST OF AROIDS CULTIVATED IN THE BOTANIC GARDENS, SINGAPORE.

Crytocoryne ciliata, Fisch.	Aquatic.		Malaya.
C. cordata, Griff.	,,		Malacca.
C. griffithii, Schott.	,,		Malay Peninsula.
C. purpurea, Ridl.	,,		Do.
C. pontederiæfolia, Schott.	,,		Johor.
Lagenandra toxicaria, Dalz.	,,		Ceylon.
Pistia stratiotes, L.	,,	"Kiamban"	Tropics.
Arisaema anomalum, Hemsl.	Tubers	(Tuber)	Perak.
A. fimbriatum, Masters.	,,		Lankawi.
Typhonium javanicum, Miq.	,,		Malaya.
T. trilobatum			Do.
T. cuspidatum, Bl.	,,		Indo-Malaya.
T. divaricatum			Do.
Amorphophallus Rex, Prain.	,,		Malay Peninsula.
A. campanulatus, Bl.	,,	Edible	India.
A. Prainii, Hook, fil.	,,		Selangor
A. hæmatospadix, Hook, fil.	,,		Lankawi.
A. titanum, Becc.	,,		Sumatra.
A. oncophyllus, Hook, fil.	,,		Sumatra.
A. sativus, Bl.	,,	Edible	Java.
A. variabilis, Bl.	,,		Malaya.
A. sp.			Johor.
Anchomanes Hookeri, Schott.	,,		West Africa.
Hapaline Brownii, Hook, fil.	,,		Kedah
Remusatia vivipara, Schott.			Siam.
Colocasia antiquorum		"Keladi" Edible	Tropics.
C. do., var. *Fontanesii*,		Tania Eddoe.	
C. do., var. *nymphexfolia*		,,	
C. do., var. *illustris*		,,	
C. Devansayana, Lind.		,,	New Guinea.
C. affinis, Schott (*Alocasia Jenningsi*)			India.
C. gigantea, Hook, fil.			Selangor.
Alocasia cucullata, Schott.			India.
A. indica, Schott.		Edible.	
var. *metallica*			
A. macrorrhiza, Schott.		Edible.	East Indies.
A. var. *variegata*			
A. denudata, Engl.			Singapore.
A. do., var. *longiloba*			Java and Malay Peninsula.

Alocasia denudata, var. *Curtisii*		Lankawi.
A. *do.*, var. *Thibautiana*		Borneo.
A. *Lowii*, Hook, fil. (*A. veitchii*, Schott)		Borneo, Malay Peninsula.
A. *do.*, var. *grandis*		Perak.
A. *Singaporensis*, Hort.		Unknown.
A. *Lindenii*, Hort.		New Guinea.
A. *Sanderiana*, Bull.		Philippines.
A. *Villeneuvei*, Lind.		Borneo.
A. *Beccarii*, Engl. (*A. Perakensis*)		Borneo, Perak.
A. *ovalifolium*, Ridl.		Malay Peninsula.
A. *cuprea*, Koch.		Borneo.
Schizocasia Portei, Schott.		Philippines.
Caladium bicolor, Vent.	Tuber.	South America.
C. and many varieties and hybrids.		
C. *Humboldtii*, Schott. (*C. argyrites*)		Brazil.
Xanthosoma Lindenii, Engler	Rhizome.	New Grenada.
X. *violaceum*, Schott.	Edible.	West Indies.
X. *robustum*, Schott.	Edible.	Mexico.
Philodendron acrocardium, Schott.	Climber.	Brazil.
Ph. *asperatum*, Koch.	Do.	Brazil.
Ph. *gloriosum*, Andre.		Colombia.
Ph. *imperialis*, Schott.		Brazil.
Ph. *lacerum*, Schott.		West Indies.
Ph. *verrucosum*, Mathieu. (*Ph. Carderi*, Hort.)		Colombia.
Ph. *Wendlandi*, Schott.		Central America.
Ph. *nobile*		South America.
Ph. *giganteum*, Schott.		Trop. America.
Ph. *tripartitum*, Schott. ?		West Indies.
Ph. *Mamei*, Andr.		Ecuador.
Rhektophyllum R. mirabile, N. E. Br. (*Nepthytis picturata*, Bull.)		West Africa.
Aglaonema Griffithii, Schott.	Aquatic.	Malacca.
A. *oblongifolium*, Schott.	Terrestrial.	Malay Peninsula.
A. *do.*, var. *Curtissi*,		Penang.
A. *Schottianum*, Miq.		
A. *Haenkei*, Schott.		Philippines.
A. *commutatum*, Bl.		
A. *do.*, var. *pictum*		Java.
A. *simplex*, Bl.		Java.
A. *angustifolium*, Br.		Singapore.
A. *Mannii*, Hook, fil.		West Africa.
A. *costatum*, N. E. Br.		Lankawi, Siam.
A. *do.*, var. *inornatum*		Do.
A. *do.*, var. *virens*		Do.
A. *Siamense*,		Siam.
A. *pictum*, Kunth.		Malay Islands.
A. *minus*, Hook, fil.		Singapore.

Aglaonema minus, var. *maculatum*		Singapore.
A. versicolor, Hook, fil.		Malay Islands.
A. rotundum, Brown.		Siam.
Montrichardia arborescens, Schott.		Brazil.
Homanolema sagittifolium, Jungh.		Malay Peninsula.
H. paludosa, Hook, fil.		Do.
H. rostratum, Griff.		Do.
H. rubescens, Kunth.		Do.
H. caerulescens, Jungh.		Do.
H. do., var. *pontederiæfolia*,		Do.
H. Singaporensis, Regel.		Unknown.
H. humilis, Hook, fil.		Penang.
H. Griffithii, Hook, fil.		Singapore.
H. do., var. *obliquata*		
H. do., var. *Kingii*		
H. pumila, Hook, fil.		Singapore.
H. do., var. *purpurascens*		
H. do., var. *argyrea*		
H. Curtisii, Ridl.		Perak.
H. angustifolia, Hook, fil.		Malay Peninsula.
H. argentea, Ridl.		Malacca.
H. fasciata, Ridl.		Borneo.
H. (*Curmeria*) *Wallisii* Regel.		Colombia.
Piptospatha Ridleyii, Hook, fil.		Johor.
Schismatoglottis calyptrata, Zoll.		Malaya.
Sch. var. *concolor*		
Sch. var. *picta*		
Sch. var. *albidomaculata*		
Sch. Wallichii, Hook, fil.		Singapore.
Sch. var. *fasciata*		
Sch. crispata, Hook, fil.		Borneo.
Sch. pulchra, N. E. Br.		Do.
Sch. longispatha, Bull.		Do.
Sch. brevipes, Hook, fil.		Perak.
Sch. multiflora, Ridl.		Borneo.
Dieffenbachia baraquiniana, Lem.		Brazil.
D. picta, Schott		Do.
D. olbia, Lind.		
D. Jenmanni, Veitch.		British Guiana.
D. seguine, Schott.		
D. imperialis, Lind.		Peru.
D. Reginae		
D. Bowmanni, Veitch.		Brazil.
D. Wallisii, Linden.		Colombia.
D. picturata		
D. meleagris, Linden.		
D. Leopoldii, Bull.		Venezuela.
Rhodospatha blanda, Schott.		Brazil.
Anadendrum montanum, Schott.	Climber.	Singapore.
A. marginatum, Hook, fil.	,,	Selangor.

Anadendrum medium, Schott. (*Pothos celatocaulis*)	Climber.	Singapore.
Spathiphyllum cannaefolium, Schott.	Herb.	Trop. America.
S. *Patinii*, N. E. Br.	,,	Colombia.
Monstera deliciosa, Adans.	Climber.	South America.
Scindapsus pictus, Hassk.	"	Malaya.
Sc. *hederacea*, Schott.	"	Do.
Sc. *argyræa*, Engl.	"	Philippines.
Sc. *Beccarii*, Engl.	"	Borneo, Malay Peninsula.
Rhaphidophora Maingayi, Hook, fil.	"	Singapore.
R. *minor*, Hook, fil.	"	Malay Peninsula.
R. *pertusa*, Schott.	"	Ceylon.
R. *Korthalsii*, Hook, fil.	"	Singapore.
R. *decursiva*, Schott.	"	India.
R. *aurea*, (*Pothos aurea*)	"	Solomon Islands.
R. *laetevirens*, Ridl.		Penang.
R. *humile*, Ridl. (Amydrium humile)		Penang.
R. *giganteum*, Ridl.		Singapore.
Lasia spinosa, Thw.	Aquatic.	Malay Peninsula.
Dracontium polyphyllum, L.		Guiana.
Podolasia stipitata, Br.		Malay Peninsula
Cyrtosperma lasioides, Griff.	Aquatic.	Do.
C. *Johnstonii*, N. E. Br.		Solomon Isles.
C. *ferox*, Lind & Brown.	Aquatic.	Perak, Borneo.
Anthurium Andræanum, Lind.		Colombia.
A. *Bakeri*, Hook, fil.		Central America.
A. *crystallinum*, Linden.		Peru.
A. *ferrierense*, Hort.		Garden hybrid.
A. *macrolobum*, Bull.		Do.
A. *pedato-radiatum*, Schott.		Mexico.
A. *strictum*, N. E. Br.		Paraguay.
A. *Wardianum*,		South America.
A. *Warocqueanum*, Moore.		Colombia.
A. *giganteum*, Engl.		Ecuador.
A. *splendidum*, Bull.		Colombia.
A. *coriaceum*, Engl.		Brazil.
A. *insigne*, Masters.		South America.
A. *ornatum*, Schott.		Venezuela.
A. *Veitchii*, Masters		
Pothos scandens, Lind.	Climber.	Ceylon.
Acorus Calamus, Lind. "Jeringu"	Rhizome.	Whole World.
A. gramineus,		China.
A. " var. *variegatus*		

COTTON EXPERIMENTS IN THE BOTANIC GARDENS, SINGAPORE.

During the year 1904, the Botanic Gardens, Singapore, received from the Inspector-General of India, a large series of seeds of various cotton plants obtained through the agency of District Officers in various parts of India. There were about 80 kinds in all. These were planted in the most suitable soil available in the Gardens, and carefully tended. The seed, in most cases, germinated well, but a few strains such as Nagpur, Griffin, Peterkin's Long Staple, Hawkin's improved, Trint's big ball, and some others completely failed. But, as these were nearly all in one set of beds, I attribute this rather to the fault of the soil, than the seed.

Of this set of Nagpur cottons, the best grower was Bourbon, but it failed to fruit sufficiently heavily.

Nearly all the plants flowered well, but the fruiting proved a failure, the pods being destroyed by vermin before they were ripe. The Nagpur broad-leaved varieties were more severely attacked by the leafrollers than were the narrow-leaved forms (*Neglectum* series) and were also more liable to attack by the red cotton bug, *Dysderccus cingulatus*. Of the *Neglectum* series, Braisa and Jàlna yellow, made the best growth, but the pods produced were very small.

Egyptian and American cottons grew fairly well, but suffered badly from pests, and I am inclined to think that the Sea-Island and Upland strains are most suitable for this country.

I should not however recommend any one here, at least in the South of the Peninsula, to attempt to grow cotton commercially. The number of pests which attack the plant in this part of the country is very large indeed.

A leaf-rolling caterpillar, and a small boring caterpillar attacking the shoots damage the vegetative organs severely. The fruit, as soon as it sets, is attacked by the red bug, a pink moth-caterpillar which devours the seeds, and a minute dipterous larva. These so utterly destroy the fruit that not one per cent. comes to maturity. Many plants though flowering well did not produce a single good pod and of many kinds I was unable to save a single seed, the pods being quite rather long before the seed was ripe. Spraying with insecticides had little effect, *Dysdercus* destroyed one day thus, was quickly replaced by others which appeared from some more distant spot in a few days. One or two kinds of caterpillar hunting wasps were often at the bushes carrying off the leaf-rollers, but made little impression in their numbers.

I had hoped that out of the numerous varieties sent from India, some might be found more resistant to insect pests than others, but though the narrow-leaved forms were less attacked by leafrollers than the broad-leaved ones, and owing to their narrower bracts less attacked by red bug, they like the others suffered badly from the pod destroying caterpillars, which of course being inside the pods could not be destroyed by spraying. The soil and constant wet of the Peninsula makes it at least in the Southern part quite unsuitable for the plant, but the pests alone would be sufficient to destroy any chance of successfully growing the plant on a large scale.

COTTON CULTIVATION IN THE FEDERATED MALAY STATES.

Sir,—I have the honour to submit, at your request, a short report on the cultivation of cotton in the Federated Malay States.

2. But little progress has been made in this direction at the Experimental Plantations, Batu Tiga, and the results so far obtained are far from encouraging. The Egyptian variety was tried last year: the seeds germinated very well and for a time the young plants looked very promising; but, during the long spell of wet weather which followed, they were attacked by a mite, and a large percentage destroyed. The plants which survived the attack were allowed to remain with the object of procuring seeds from the more robust plants for a further trial. During the unusually dried weather experienced during the early part of the present year, these plants improved considerably, and are now fruiting though the crop is poor and the cotton much stained. A picked sample of this cotton is being forwarded to the Imperial Institute for valuation and report.

3. About an acre of land was planted early in the present year with 'Upland,' 'Sea-Island' and Egyptian varieties, but not more than about 1 per cent. of the seed germinated, and it is impossible to estimate from the few remaining plants, what the result would have been had the seed been good.

4. Another batch of seed, consisting of some 22 varieties, has been recently planted. These have germinated well and so far are apparently free from disease.

5. There appears to be little to add to my letter No. Ex. Plants 121/03 of October 30th last, when I pointed out that the uncertainty of the seasons, the peculiar susceptibility to pests—both insect and fungoid—and the limited labour-supply, are in themselves sufficient to deter agriculturists from embarking upon this cultivation.

5. Experiments on a small scale are being continued at Batu Tiga, and if the work results in the establishment of a type suited to the conditions obtaining in the Federated Malay States, it is possible that natives and Immigrant coolies may (with Government Assistance) take up the cultivation of cotton; but it is, I think, practically certain that it will never pay for European supervision, the profits being too small and the venture too risky.

7. The tree cotton (*Gossypium Arboreum*) is cultivated to a limited extent in Negri Sembilan and elsewhere, but the staple of this is too short to be of use to the spinners, and need not therefore be taken into consideration.

I have, etc.,
STANLEY ARDEN,
Superintendent, Experimental Plantations.

IMPERIAL INSTITUTE.

South Kensington, London, S. W.

Report on a sample of cotton from the Federated Malay States, by Professor WYNDHAM R. DUNSTAN, M. A. F. R. S., Director.

Ref. No. 8,165.

In connection with the general enquiry which is being carried on at the Imperial Institute with reference to cotton growing in the various British Colonies and Dependencies, a letter, dated the 13th July, 1904, was addressed to the High Commissioner of the Federated Malay States, asking for information with regard to the prospects of cotton cultivation in these States and also for representative samples of the products.

2. In reply, a letter dated the 9th September, 1904, was received from the High Commissioner, in which it was stated that a sample of Egyptian cotton grown in the Federated Malay States was being forwarded to the Imperial Institute for valuation and report. This letter was accompanied by a copy of a report by Mr. STANLEY ARDEN, Superintendent, Experimental Plantations, Selangor, dated the 30th August, 1904, and also by some printed correspondence containing the opinions and experience of planters and others on the subject of cotton growing in the Federated Malay States.

The samples of cotton were received in due course at the Imperial Institute, with a letter from the Superintendent of Experimental Plantations, dated the 26th October, 1904, which states that the cotton had been grown from Egyptian seed in the Government Experimental Plantations, Batu Tiga, Selangor.

The samples have been examined in the Scientific and Technical Department of the Imperial Institute and the commercial value of the cotton has been ascertained by reference to experts. Sample No. 1 was labelled "Egyptian Cotton," (Hand-ginned) and consisted of about 4 ozs. of brownish cotton of somewhat uneven colour and good average strength. On comparing this material with a standard brown Egyptian cotton, it was found to be slightly inferior in colour fineness, softness, and lustre, but was of good length varying from 1.2 to 1.5 inches. Sample No. 2 was labelled "Egyptian Cotton" and consisted about 8 ozs. of unginned cotton of apparently the same growth as Sample No. 1. The seeds were smooth and dark brown in colour, the fibre was easily detached from the seeds and possessed the characters already described.

The commercial experts reported that the ginned cotton was clean, of good hard staple, mixed in colour and worth about 5*d.* per lb. "Fully good fair brown Egyptian" cotton being quoted on the same date at 6¾*d.* per lb. and "Middling American" at 3¾*d.* per lb.

From the foregoing report, it is evident that the cotton is somewhat inferior to the average qualities of Egyptian cotton. This inferiority is probably due to deterioration caused by the adverse climatic conditions to which the plants were subjected in the early period of their growth. The cotton is nevertheless of fair quality, and if this standard could be maintained and a moderate yield secured, the cultivation might prove remunerative. In any case, it certainly appears desirable that the experiments, referred to in the report of the Superintendent of the Experimental Plantations which are being carried on with the object of establishing a type of cotton capable of withstanding the local conditions, should be continued.

WYNDHAN R. DUNSTAN.

3rd March, 1905.

FIBRE OF MELOCHIA

M. CORCHORIFOLIA.

This is a wiry weed, very common in cleared ground and easily recognized by its small heads of little pink flowers with an ocre yellow eye. The stems are tough and slender, covered with a thin light brown bark. I cannot find any allusion to its bark having been experimented with as a fibre producer except a reference to the fact that it is said to produce a fibre in Watts' Dictionary of Indian Products.

The plant came up abundantly in ground which had been cleared in the Botanic Gardens for Sanseviera culture, and when the stems had grown to about 3 feet long, a number were collected. The bark was then stripped off, in the same way that is done with the Ramie plant, and soaked and beaten in water. This took about a week to do when a bundle of fibre was obtained, of by no means inferior quality. The fibre is about 2 feet long, fine and strong, and beautifully silvery white, in fact, quite silky.

The sticks with bark on weighed 26 ozs., the bark when removed weighed 13 ozs. This gave 2 oz. fibre or 6½ per cent. on the bark. It may be doubted whether this fibre would ever pay for cultivation, as it is not a close grower and does not attain the height of jute, and further more, the cost of extracting it would perhaps be too great, as a good deal of hand work has to be used in stripping the bark, but it is a fibre certainly suited for native work, on a smaller scale. No report on it has been procured as yet, but further experiments with this fibre will be tried.

The plant belongs to the order *Sterculiaceæ* and is known to the Malays as Lumak Kutam. They use the leaves and roots as an outward application in Small-pox, and also in cases of Dysentery. It is a common weed all over the East.—*Editor.*

FIBRE AND HEMP INDUSTRY IN STRAITS SETTLEMENTS AND FEDERATED MALAY STATES.

BY C. J. SCHIRMER.

Singapore, 19th June 1905.

THE EDITOR,
Agricultural Bulletin,
Straits Settlements and Federated Malay States.

DEAR SIR,—With reference to the conversations we had *re* Fibre and Hemp industry in the Straits and Federated Malay States, I take the liberty to give you on this subject my opinion, based on many years' experience.

Anyone who can obtain the necessary raw material would soon find this trade very profitable, as it justifies systematic cultivation on a big scale, when one considers the comparatively small outlay and the impossibility of obtaining sufficient quantities of the wild plant, but succeed in fibre cultivation in a country where this industry is new and unknown to planters, and the produce unknown to nearly all merchants, the promoter must have patience, courage and a clear knowledge of the business and of what constitutes favourable circumstances.

The first thing to make a fibre venture work and pay, is not, as is always believed, the mechanical decortication or rather the question of machinery, but, as stated above, to have sufficient and well cultivated and conveniently situated raw material belonging to the factory, situated on a big fresh water river. The best position is the delta where the plantation should be made around the factory (taking care to have the option of hinterland to extend the plantations if required). It should be easy and cheap from the nature of the situation and with the aid of proper means of transport, to carry the product at any moment to the factory, expenses of transport being reduced to the lowest possible cost.

As leaves of fibre plants contain only between 1½–5 per cent. dry fibre, it will be seen that to make one ton of dry fibre the manufacturer must have cut transport and work 20–66 tons of raw material; on an average, if he works different sorts of fibres 40 tons, and as a rule, I say a factory should not be erected and not worked if it already exists, if it cannot obtain the raw material, delivered at the factory, at a cost not exceeding one-third of the daily European market price of the fibre intended to be manufactured. Say, for instance, to-day's market price for Aloes is £30 per ton, 1/3 gives £10 or $100. As the return of Aloe is about 3 per cent. the manufacturer requires for making one ton of dry Aloe fibre 33 tons of raw material which must not cost more than $100 or $3.33 per ton delivered at the factory.

Can a maunfacturer buy from natives at this price, if they have to bring it in small quantities for miles and miles? No. Can a manufacturer obtain it from his own plantations, if situated all around his factory? Yes, and cheaper.

Therefore, what can be done with the best machine, if you have not sufficient and cheap raw material?

That machines for working fibres exist is, I believe, known to everybody.

The question has often been put by European fibre-merchants, why does not Singapore export Pineapple fibre as it appears that there is plenty of raw material, and it is not necessary to cultivate more? The reasons are very simple.

Pineapples (if cultivated in the sun for fruits) give a very short and light fibre of only about 2 per cent. return; therefore, to make one ton fibre (dry) it is necessary to work about 800 piculs of leaves. The price for one picul of leaves, asked by natives, delivered in Singapore, is $0 60 and higher, or the cost of the raw material nearly $480 per ton of dry fibre, more than the value of the fibre on the London market. What are the reasons for this exorbitant price of $0.60 asked by natives? The following:—

1. The very expensive bullock cart hire from the centre of cultivation at the 9th Mile in Thompson and Bukit Timah Roads and Pasir Panjang.

2. The impossibility of explaining to the Chinese cultivators that it does not spoil the plant or diminish the return in fruits to cut some leaves from each plant.

3. The necessity of cutting carefully only a few leaves from each plant, where cooly wages are expensive.

But on the other hand, to erect a factory, (to obviate the first reason) near the plantations is impossible, because there exists no clean fresh water near them nor indeed enough water to drive the engines nor enough cheap firewood for this purpose.

Therefore, to make Pineapple or any other fibre will only be possible if it is cultivated around a factory. Pineapple and some other fibres require shade, where the leaves of Pineapples for instance obtain a length of 6 to 12 feet and contain up to 3 per cent. fibre and so cultivation will cost, delivered at the factory, only $0.10 to $0.15 per picul or as raw material $80 to $120 per ton.

The points to be taken into consideration to start a fibre venture which will work and pay are the following:—

1.—Sufficient capital.

2.—Patience, courage and a clear knowledge of the cultivation and manufacture.

3.—Well situated and good land from the point of view of cultivation of plants as for the later erection of a factory and the transport of leaves from field to factory.

4.—Sufficient and cheap labour.

5.—Good and clean fresh water in sufficient quantity and sun over 35° for bleaching purpose.

6.—No cyclones or typhoons to spoil the leaves in the fields.

7.—Cheap firewood and good water-power to run the engines.

8.—Suitable climate for the development of the plants.

9.—Well-made machines with high precision and suitably erected.

All these points united constitute, what I call, favourable circumstances and I believe they all exist in the Straits and Federated Malay States in a greater degree than elsewhere.

A risk, as long the prices on the Sisal standard in London rule higher than £12 per ton, actually £37 and have never been under £16, with an average for the last fifteen years of £24, does not exist as all the fibre plants grow here very rapidly, are free from any disease, never injured by insect (even cattle do not like most of them) and can stand very wet and very dry long seasons without suffering.

Of course, it would be best to induce the natives to take up the cultivation of fibrous plants and to assist them by advances and seedlings, etc. etc.; but a factory must have its own plantations, in order to remain independent of planters, as regards price for the raw material and the regular supply to run the engines.

Should you like to have any further information regarding this for the Straits very promising industry and produce, I am at your disposal.

Your very obedient servant,

C. J. SCHIRMER.

FUNGUS ON PARA RUBBER LEAVES.

Specimens of leaves of the Para rubber seedlings attacked by the leaf-fungus mentioned in *Bulletin* 1903, p. 68, were lately sent to the Director of the Royal Gardens, Kew, and Mr. G. MASSEE reports that "the pale blotches on the leaves are caused by some species of *Cercospora*, but the absence of fruit prevents specific identification. The leaves have been placed under conditions favourable to the growth of the parasite which, however, appears to have been killed outright."

There are about 200 kinds of *Cercospora* known, infecting the leaves of various herbs, shrubs and trees. Treatment of the plants with Bordeaux mixture is said, in some cases, to have produced excellent effects, but the infected leaves should be also removed, as well as all dead ones on the ground, and the ground turned over if possible.

Several planters have sent specimens of the leaf-fungus and it is clear that it is common all over the Peninsula. Except in the case of seedlings, it does not seem to do much harm, but it certainly checks the growth of young plants and might do much harm in the nurseries, if neglected.

H. N. RIDLEY.

ANALYSIS OF PARA RUBBER.

M. P. SERRE, French Vice-Consul at Batavia, writes in the *Journal d' Agriculture Tropicale,* April 30, p. 112:—

Quite dry Para rubber from the Bukit Rajah Company and very suitable for vulcanization sold at a little more than 7 francs a pound. On analysis, it was found to contain 95·37 per cent. caoutchouc, 3·02 per cent. resin, 1·24 per cent. albuminoid matter, ·37 per cent. mineral matters.

BARU: HIBISCUS TILIACEUS.

An article on the fibre of this common tree here, appears in the *Indian Forester* of June, 1905, p. 347, in which it appears that a M. LE FEVRE in Rangoon has made an attempt to introduce this fibre into commerce. He is stated to have a secret method for working the fibre and made it up into rope, matting and gunny and also dyed it of different colours. His product fetched from £20 to £35 per ton, and he obtained a concession to work the fibre in the Toringoo district, but the help he had been promised in the venture was not forthcoming and he had to stop work. It is suggested that Baru would do better than Jute in cases where the gunny bags made from it have to stand on damp ground and that the Government might grow the plant or buy it from cultivators and have it worked into gunny bags in the jails.

The plant was described in the paper on fibres in the *Bulletin,* and its abundance on our rivers was noted. It grows very readily in the edges of the tidal rivers, and in nipah swamps and would probably pay well if either planted or in many cases simply aided in its growth by removing the other plants which grew among it and so giving it room to spread. The natives who make a living by collecting nipah leaves for cigarette papers might have their attention called to this fibre, of which perhaps hundred of tons are wasting on our river banks.—*Ed.*

RED COCO-NUT BEETLE.

In a paper in the *Tropical Agriculturist,* p. 153, Mr. W. JARDINE treating of coco-nuts, states that in Ceylon it is rare for the Red coconut beetle *Rhyncophorus ferrugineus,* to attack a tree over 10 or 12 feet tall, and suggests the reason for this is that it cannot fly higher.

This is curious, as full grown trees up to any size are constantly attacked and destroyed here, 60 feet and more tall. Indeed this constitutes one of the greatest difficulties of dealing with the pest. If it only attacked young plants it would be much more easy to deal with. It does fly low very often and is commonly to be found in base of stumps of sago palms which have been felled to extract the flour.

In our forests, the red beetle lives on the Bayas and Nibong palms, *Oncosperma*, of which genus there is another species in Ceylon. I have seen a Bayas tree felled by the coolies for the cabbage in the forests of Bujong Malacca, in Perak, which was visited by a *Rhyncophorus* in less than twenty minutes after the tree was cut up, so quickly did it scent the cut-up tree.

H. N. RIDLEY.

RUBBER SALES.

A quantity of Biscuit rubber made in the Botanic Gardens, Singapore, was recently sold by HECHT LEVIS and KAHN. It was in two lots, the larger consisted of fine white biscuits made with acetic acid and dried with the aid of calcium chloride, and fetched ~~f.~~36/9¼ per lb. The other, a small lot made two years ago without acetic acid, and smoked, consisted of thicker biscuits of a darker brown colour. This lot fetched only ¼*d.* less per lb. It is unnecessary to state that this little lot cost a good deal less in expense and trouble to make, and its only defect seems to be its darker colour, there being a fancy now for white biscuits.

Smoking rubber is an easy and cheap method of drying it off, and as the price is so little different from that prepared by a more elaborate and expensive process, this old process may be very suitable for small growers.—*Ed.*

SINGAPORE MARKET REPORT.

June, 1905.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	31.00	31.00
Bali	115	20.50	19.50
Liberian	78	23.00	22.00
Copra	4,311	8.25	7.30
Gambier	1,959	8.75	8.60
Cube Gambier, Nos. 1 & 2	345	12.75	12.00
Gutta Percha, 1st quality	...	300.00	150.00
Medium	...	200.00	90.00
Lower	...	80.00	12.00
Borneo Rubber 1, 2, and 3	...	142.00	90.00
Gutta Jelutong	...	7.50	7.30
Nutmegs, No. 110's	...	37.00	34.00
No. 80's	...	59.00	56.50
Mace, Banda	...	85.00	80.00
Amboyna	...	56.00	55.00
Pepper, Black	1,385	28.62½	25.75
White (Sarawak)	399	39.50	37.00
Pearl Sago, Small	25	4.25	3.80
Medium	...	4.50	
Large	...	5.50	
Sago Flour, No. 1	3,018	3.22½	3.05
No. 2	170	0.80	
Flake Tapioca, Small	362	4.70	4.65
Medium	...	...	...
Pearl Tapioca, Small	358	4.80	4.60
Medium	466	4.75	4.70
Bullet	40	6.00	5.70
Tin	2,770	81.75	79.62½

Export Telegram to Europe and America.

Fortnight ending 15th June, 1905.

Wired at 4.35 P.M. on 16th June, 1905.

				Tons.
Tin	Str.	Singapore and Penang to	United Kingdom &/or	1,380
Do.	„	Do.	U. S. A.	585
Do.	„	Do.	Continent	205
Gambier	„	Singapore	Glasgow	...
Do.	„	Do.	London	...
Do.	„	Do.	Liverpool	275
Do.	„	Do.	U. K. &/or Continent	95
Cube Gambier	„	Do.	United Kingdom	70
Black Pepper	„	Do.	Do.	25
Do.	„	Penang	Do.	...
White Pepper	„	Singapore	Do.	150
Do.	„	Penang	Do.	...
Pearl Sago	„	Singapore	Do.	45
Sago Flour	„	Do.	London	50
Do.	„	Do.	Liverpool	1,640
Do.	„	Do.	Glasgow	325
Tapioca Flake	„	Singapore & Penang	United Kingdom	310
T. Pearl & Bullets	„	Do.	Do.	400
Tapioca Flour	„	Penang	Do.	200
Gutta Percha	„	Singapore	Do.	35
Buffalo Hides	„	Do.	Do.	70
Pineapples	„	Do.	Do.	cases 41,000
Gambier	„	Do.	U. S. A.	725
Cube Gambier	„	Do.	Do.	25
Black Pepper	„	Do.	Do.	210
Do.	„	Penang	Do.	...
White Pepper	„	Singapore	Do.	40
Do.	„	Penang	Do.	...
T. Flake & Pearl	„	Singapore & Penang	Do.	375
Nutmegs	„	Do.	Do.	17
Sago Flour	„	Singapore	Do.	200
Pineapples	„	Singapore	Do.	cases 4,500
Do.	„	Do.	Continent	„ 2,500
Gambier	„	Do.	S. Continent	70
Do.	„	Do.	N. Continent	75
Cube Gambier	„	Do.	Continent	45
Black Pepper	„	Do.	S. Continent	...
Do.	„	Do.	N. Continent	120
Do.	„	Penang	S. Continent	...
Do.	„	Do.	N. Continent	...
White Pepper	„	Singapore	S. Continent	...
Do.	„	Do.	N. Continent	120
Do.	„	Penang	S. Continent	...
Do.	„	Do.	N. Continent	...
Copra	„	Singapore & Penang	Marseilles	520
Do.	„	Do.	Odessa	...
Do.	„	Do.	Other South Continent	150
Do.	„	Do.	N. Continent	800
Sago Flour	„	Do.	Continent	625
Tapioca Flake	„	Singapore & Penang	Do.	85
Do. Pearl	„	Do.	Do.	190

				Tons.
Copra	Str	Singapore	England	...
Gambier	,,	Do.	U. S. A.	...
Cube Gambier	,,	Do.	Do.	...
T. Flake and Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	...
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	...
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	...
Pineapples	,,	Do.	Do	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,	Do.	Do.	.
T. Flake & Pearl	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...

950 tons Gambier } Contracts.
800 ,, Black Pepper }

Export Telegram to Europe and America.

Fortnight ending 30th June, 1905.

Wired at 2.50 P.M. on 1st July, 1905.

				Tons.
Tin	Str.	Singapore & Penang to	United Kingdom &/or	1,518
Do.	,,	Do.	U. S. A.	790
Do.	,,	Do.	Continent	590
Gambier	,,	Singapore	Glasgow	...
Do.	,,	Do.	London	100
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	U. K. &/or Continent	250
Cube Gambier	,,	Do.	United Kingdom	15
Black Pepper	,,	Do.	Do.	10
Do.	,,	Penang	Do.	90
White Pepper	,,	Singapore	Do.	70
Do.	,,	Penang	Do.	...
Pearl Sago	,,	Singapore	Do.	10
Sago Flour	,,	Do.	London	25
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	Glasgow	250
Tapioca Flake	,,	Singapore & Penang	United Kingdom	350
T. Pearl & Bullets	,,	Do.	Do.	360
Tapioca Flour	,,	Penang	Do.	1,300
Gutta Percha	,,	Singapore	Do.	70
Buffalo Hides	,,	Do.	Do.	35
Pineapples	,,	Do.	Do.	cases 20,000
Gambier	,,	Do.	U. S. A.	700
Cube Gambier	,,	Do.	Do.	55
Black Pepper	,,	Do.	Do.	450
Do.	,,	Penang	Do.	290
White Pepper	,,	Singapore	Do.	30
Do.	,	Penang	Do.	20
T. Flake & Pearl	,,	Singapore & Penang	Do.	550
Nutmegs	,,	Do.	Do.	33
Sago Flour	,,	Singapore	Do.	150

				Tons.
Pineapples	Str.	Singapore	U. S. A.	cases 4,750
Do.	,,	Do.	Continent	,, 1,250
Gambier	,,	Do.	S. Continent	75
Do.	,,	Do.	N. Continent	260
Cube Gambier	,,	Do.	Continent	10
Black Pepper	,,	Do.	S. Continent	60
Do.	,,	Do.	N. Continent	10
Do.	,,	Penang	S. Continent	50
Do.	,,	Do.	N. Continent	...
White Pepper	,,	Singapore	S. Continent	10
Do.	,,	Do.	N. Continent	10
Do.	,,	Penang	S. Continent	...
Do.	,,	Do.	N. Continent	10
Copra	,,	Singapore & Penang	Marseilles	260
Do.	,,	Do.	Odessa	980
Do.	,,	Do.	Other S. Continent	400
Do.	,,	Do.	N. Continent	...
Sago Flour	,,	Do.	Continent	440
Tapioca Flake	,,	Singapore & Penang	Do.	40
Do. Pearl	,,	Do.	Do.	100
Copra	,,	Singapore	England	...
Gambier	,,	Singapore	U. S. A.	...
Cube Gambier	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	...
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	...
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	...
Pineapples	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...

1,000 tons Gambier }
625 ,, Black Pepper } Contracts.

Singapore.

Abstract of Meteorological Readings for the month of June, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·889	138·9	82·6	90·6	75·6	15·0	78·8	·906	76·3	77	S.W.	5·95	2·26

A. B. LEICESTER,
Meteorological Observer.

G. D. FREER,
for Principal Civil Medical Officer, S.S.

Kandang Kerbau Hospital Observatory,
Singapore, 14th July, 1905.

Penang.

Abstract of Meteorological Readings in the Prison Observatory for the month of June, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	°F	%		Ins.	Ins.
Criminal Prison Observatory	29·867	143·7	80·8	90·2	73·9	16·3	75·4	·778	68·81	68	S.	3·53	1·60

Colonial Surgeon's Office,
Penang, 12th July, 1905.

M. E. SCRIVEN,
Assistant Surgeon.

S. LUCY,
Acting Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for the month of June, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Durian Daun Hospital	29·813	154·3	82·2	88·3	74·9	13·8	80·0	1·000	71·5	90	S. W.	5·35	2·14

Colonial Surgeon's Office,
Malacca, 20th July, 1905.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of June, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping ..	...	155	83·03	94	71	23	78·32	907	...	80	...	6·82	3·34
Kuala Kangsar ...	...	...	80·84	93	70	23	76·46	855	...	81	...	1·78	·57
Batu Gajah ...	...	159	81·46	93	71	22	77·42	887	...	83	...	5·52	1·75
Gopeng ...	...	...	81·59	93	62	31	76·68	853	...	78	...	7·76	2·39
Ipoh ...		...	81·48	92	71	21	77·36	884	...	83	...	4·26	1·25
Kampar ...	...	...	...	...	71	...	...	...	...	...	..	6·08	2·00
Teluk Anson ...	...	...	82·37	91	72	19	77·84	893	...	81	...	5·09	1·15
Tapah ...	...	...	82·17	91	69	22	76·96	860	...	78	...	5·27	1·43
Parit Buntar ...	...	...	83·73	93	64	29	78·42	902	...	78	...	2·80	2·10
Bagan Serai ...	...	...	82·94	92	70	22	78·00	894	...	79	...	5·49	2·40
Selama ...	...	...	82·37	92	72	20	78·06	904	...	82	...	4·98	2·00

State Surgeon's Office,
Taiping, 12th July, 1905.

M. J. WRIGHT,
State Surgeon.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of June, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·886	148·8	81·4	91·2	71·6	19·6	76·4	0·817	73·2	77	Calm.	3·95	1·68
Pudoh Gaol Hospital ,,	...	...	...	...	...	...	...	...	...	...	...	2·16	0·66
District Hospital ,,	...	...	...	...	...	...	...	...	...	...	...	5·46	2·67
,, Klang	...	...	...	88·4	70·6	17·8	...	...	...	...	...	2·13	0·71
,, Kuala Langat	...	...	...	88·7	74·5	14·2	...	...	...	...	...	2·23	1·20
,, Kajang	...	...	...	91·4	72·4	19·0	...	...	...	...	...	6·26	2·18
,, Kuala Selangor	...	...	...	...	...	...	...	...	...	...	...	2·52	1·55
,, Kuala Kubu	...	...	...	92·7	72·4	20·3	...	...	...	...	...	8·72	1·83
,, Serendah	...	...	...	91·2	75.6	15·6	...	...	...	...	...	5·05	2·46
,, Rawang	...	...	...	91·8	70·0	21·8	...	...	...	...	...	5·11	2·65
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	1·28	0·74
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	...	2·90	1·30

State Surgeon's Office,
Kuala Lumpur, 20th July, 1905.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Muar.

Abstract of Meteorological Readings for the month of June, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Lanadron Estate ...	...	...	84°	91°	72°	19°	76°	...	...	...	...	3·72	·64

Muar, 9th July, 1905.

ROGER PEARS.

The Duff Development Company, Limited, Kelantan.

Abstract of Meteorological Readings for the month of June, 1905.

DISTRICT.	Temperature.			Rainfall.	
	Maximum.	Minimum.	Range.	Total Rainfall.	Greatest Rainfall during 24 hours.
	Mean. °F	Mean. °F	Mean. °F	Inches.	Inches.
Kuala Lebir ...	90·5	71·2	19·3	12·66	3·36
Liang ...	89·4	72·1	17·3	13·60	2·32

Surgeon's Office,
July 4th, 1905.

JOHN D. GIMLETTE,
Surgeon.

No. 8.] AUGUST, 1905. [VOL. IV.

AGRICULTURAL BULLETIN
OF THE
STRAITS
AND
FEDERATED MALAY STATES.

EDITED BY
H. N. RIDLEY, M. A., F. L. S.,
Director of Botanic Gardens, S. S.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.

AGRICULTURAL BULLETIN
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No. 8.] AUGUST, 1905. [VOL. IV.

RESULTS OF THE EXPERIMENTAL TAPPINGS OF HEVEA BRASILIENSIS

AT THE ECONOMIC GARDENS AT TJIKEUMEUH MADE DURING 1900–1904

BY DR. W. R. TROMP DE HAAS.

By permission of the author, we publish a translation from the Dutch of the experiments on Para Rubber conducted in the Economic Gardens in Java. The paper was published in Teysmannia, Part 10 (1905), p. 182. The system of coagulating with alcohol is interesting though not practicable commercially on account of expense. It will be noticed too that stress is laid on the dryness from sun and wind interfering with tapping. The importance of sufficient humidity in the estate, especially in the ground, is becoming more and more evident and this will have a great bearing on the selection of sites for plantations. There is little doubt that the latex is formed in the roots and that a larger proportion of latex can be extracted when the tree is turgescent from a liberal supply of water absorbed by the roots. Hence it would seem of the greatest importance that the roots should be able to obtain a sufficient supply of water for the tree, which might not be the case in very dry ground.

We shall here once more shortly review the results which we have obtained to this day, concerning the tapping of *Hevea Brasiliensis.* They have gradually led us to the methods of tapping which are now used by us.

In the first year, the experiments made on the *Hevea* trees growing in the Economic Gardens shewed us that the yield of the latex of *Hevea Brasiliensis* attains its highest point after the tapwounds have been re-opened several times in succession at intervals.

The first tappings were made as follows :—

In the stems of the trees, as high up as possible, with the aid of an ordinary carpenter's chisel, incisions about 7 c. m. long were made under each other at distances of 25 c. m., at angles of about 30°.

The distance of the incisions measured along the circumference of the stem was so chosen that the free spaces were about two-thirds of the total circumference in order not to impede the circulation of the sap.

A thin slice was cut away from the lower edge of the incisions with the chisel the next day. This was repeated nine times.

To catch the latex, a small cup, +8 c. m. wide and +8 c. m. deep, made of thin tin sheeting, was placed under each row of incisions.

A pin was soldered on to the edge of the cup with which it could be fastened on to the stem. The space between the stem and the edge of the cup was plastered with clay in order to prevent loss of latex.

From the latex collected in the cups the rubber was obtained by coagulating with alcohol, and afterwards drying in shade and wind.

The results of the first tapped tree prove :—

1. The observations of PARKINS hold true also with *Hevea Brasiliensis.*

2. That the quantity of rubber first increases and then declines.

In order to be able to draw fair comparisons, we must choose other measures than those used so far, where only the yield of the latex of a tree is considered.

It is clear that the quantity of latex obtainable depends upon the area of bark * which can be tapped.

The larger the area of the tree the more rubber may one expect to obtain.

If equal areas of bark yield unequal amounts of rubber on tapping, then the difference is due to the trees themselves or the cause lies outside. In the former instance, we must only choose seeds of good latex-producing varieties, in the latter case we must strive to obtain better methods of cultivation.

The following two cases may serve to shew this :—

Of two trees tapped under similar conditions and methods, one (No. 14) yielded 1214 grammes and the other (No. 9) 1700 grammes of rubber. One would now say that tree No. 9 is richer in rubber than tree No. 14. This, however, is not the case as the yield depends upon the surface that is tapped. The tapped surface of tree No. 9 was 2 square metres and that of tree No. 14 was 0·91 M^2. †

---

* In the calculation of bark surface, the part of the tree to be tapped is looked at as if it were a cut cone, not strictly true, the error is of little consequence, however, to our aim. The surface of the sides of this cone is equal to that of a parallelogram of which the equal sides are equal to the circumference of respectively the top and bottom place of the cone and the circumference of the tree is measured at the base and the top to where it is tapped and the distance from the top to the bottom incision.

† This difference is due to the variations of the thickness of the trunk.

Reduced to 1 M^2 of tapped surface, then tree No. 14 seems to be a better rubber-producer than tree No. 9.

No. 14 gave, rather should have given, 1334 and No. 9, 850 grammes of rubber per M^2 of tapped surface.

The individual differences in the product of latex given by the above methods of tapping are clearly shewn by the results of the first year's tapping of two 24-year old trees growing next to each other and tapped at the same time and by the same methods.

Tree No. 10 was tapped over a surface of 4·5 M^2 and tree No. 11 of 3·35 M^2.

The yield was, respectively, 380 and 608 grammes or 84·4 and 181·5 grammes per M^2.

Tree No. 11 yielded more than twice the quantity of rubber, notwithstanding that the other was tapped over greater surface.

From these experiments we may conclude that there exists a great deal of individual difference in the yield of rubber amongst the trees cultivated in the Gardens.

These trees are also different in their forms. The best rubber producer is compact, has a thick crown and leaves of which the length and breadth are nearly equal, while the crown of the other is wider and the leaves are longer.

In the first year of tapping, the influence of the season is also apparent.

Tree No. 2 was tapped in August (the dry season) and again in November. The yield was, respectively, 411 and 390 grammes per 2·79 M^2 of tapped surface or per M^2, respectively, 147·3 and 139·8 grammes.

This shews that the difference in this case was not large. It may be noted that the East Monsoon was drier than the West Monsoon but not much, however, as may be seen from the Rain-tables.

In the dry season there were, during the time of tapping, 6 rainy days with 148 m.m. of rain, while during the wet season, these figures were 13 and 165.

If the humidity of the soil is large[*] and if the rains are equally distributed during the tapping season, then there ought to be no large difference between the yield of the wet and dry seasons.[†]

We shall have the opportunity of following these results for consecutive years. From the above results, we may also reduce that full grown trees may, according to our system, be tapped twice a year.

The second year will shew how far an increase of the number of incisions increases the yield of the rubber.

---

[*] In our case we have to deal with clayey soil.

[†] Large differences are caused in cases where factors that cause drying, such as a clear sky, much sun and wind, are acting during the tapping. Of this, we have been able to amply satisfy ourselves, and for that reason the trees are tapped as early as possible in the morning and tapping is not continued longer than till 10 A.M.

For that purpose a few trees were, in that year, worked with a larger number of incisions than was the case in the previous year.

Tree No. 3 yielded, at the first tapping in the first year from a surface of 2·6 M^2 and a total length of the incisions of 104 cm., 411 grammes of rubber.

At the second tapping in November of the same year, these figures were, respectively, as follows, 2.6 M^2; 320 c. m. and 998 grammes:—and at the third tapping in the following year, 3.27 M^2; 740 c.m., and 1332 grammes.

Reducing the yields to M^2 surface, then we get with 104, 320, and 740 cm. lengths of incisions, respectively, 158, 384 and 407 grammes. With a proportion of lengths of incisions of 1 : 3 : 7; the ratio of the yield is as 1 : 2 : 4 : 2·6.

These last are not in proportion to the number of incisions. The most unfavourable is the case in which the number of incisions is taken 7 times greater.

The figures are readily comparable, because the tap periods were nearly equally moist, only in the last case it was cut 10 times instead of 11 times, as had been done in the other instances.

It is a mere chance if the temperature of the one year is the same during tapping season as that of the following year.

Small variations do not harm, but large differences in the number of rainy days and the quantity of fallen rain influence the yield of rubber to a high degree as we shall be able to point out with figures of our experiments of tapping.

From the above experiments we see that an increase of the number of incisions furthers the yield of rubber, but not in the same proportion.

As the incisions always cause more or less harm to the tree, we must not make this number greater than is necessary to get nearly the biggest possible yield.

According to the above experiments, an increase of 23 grammes of rubber per square metre of tapped surface is only obtained after more than doubling the number of incisions.

In the second year, the trees were tapped as high as possible, usually to the point where the branches begin to appear. In order to be able to tap at that height, ladders had to be used.

In this way, however, much time was wasted in the collecting. We then came to the conclusion that it is of no advantage to tap the trees to a height which the native tappers could reach with ease without having to make use of ladders.

From former experiments made, we knew already that the lower part of the trunk gave the bigger yield.

We shall see from experiments of the second and third year that the lower tapping is more advantageous.

Let us therefore take the figures which the trees Nos. 4, 12 and 20 have given in the two years.

These trees were tapped in both years in nearly similar weather conditions, a factor which must be considered if we wish to make just comparisons.

The number of incisions, as was the case in both years, was not precisely the same, but this small difference cancelled the drawback of the unfavourable method of tapping.

NUMBER OF TREE.		1901.			1902.		
		4	12	20	4	12	20
Height of tapping	M.	3·30	2·59	3·67	1·5	1·5	1·5
Surface tapped	M. 2	3·65	2·77	4·50	1·9	1·7	2·0
Total lengths of incisions	C. M.	354	301	405	320	320	320
Total yield	Grs.	792	713	958	810	780	230
Yield per M. 2 of tapped surface	Grs.	217	257	213	426	459	615

The above figures speak for a tapping of the tree to a height of 1·5 metre.

In the year 1901, the question arose whether it was not more advantageous to make fewer and longer incisions than more and short ones.

The trees 13, 14, 19 and 20 of 1901 were tapped as high as possible and the incisions made 20-30 c.m. long.

In the following year 1902, the trees were tapped lower and the incisions made not longer than 10 c. m.

In 1901, the incisions were reopened on the upper as well as lower edge, and in 1902 only on the lower edge.

The results of both years were as follows :—

No. of Tree.	1901.				1902.			
	13	14	19	20	13	14	19	20
No. of rainy days, M. M.	10	4	5	8	3	3	13	13
Height of tapping, M.	3.28	3.66	3·0	3.67	0.65	0.62	1.5	1.5
Tapped surface M 2.	4·33	4·43	3·39	4·5	0.97	0.91	2.03	2.0
Total length of incisions c. m. ...	5.88	667	356	405	200	160	320	320
Total yield, Grs.	968	630	948	958	600	460	1500	1230
Yield per M 2. of tapped surface Grs.	224	142	280	213	619	506	732	615

Inasmuch as the temperature variations during both tapping periods were not the same (by 13 and 14, the one in 1901 was more favourable than in 1902), the variations of the yield were of such a manner that we may deduce from the experiments that it is not advisable to make long incisions.

The long incisions also have the disadvantage that they require a considerable time to heal.

In 1901, the question arose whether reopening the incisions, above as well as below, did not bring about an increase of the yield.

To that effect the incisions on one side of each of four trees were only reopened on the upper edge and those on the other side on both upper and lower edge. The results were as follows:—

No. of Tree.	7.		21.		22.		23.	
	a	*b*	*a*	*b*	*a*	*b*	*a*	*b*
Tapped surface M^2. ...	2·33	2·33	1·39	1·39	1·77	1·77	1·645	1·645
Total yield, Grs. ...	380	552	181	370	236	403	221	300
Yield for M^2., Grs. ...	163	237	130	266	133	228	134	182

a.—Only tapped on lower edge. *b.*—Tapped on both edges.

The figures shew that the incisions reopened on both upper and lower edges and gave more rubber than those where only the lower edge was worked.

In the first case, the average yield was 143 grammes per M^2 of surface and the other 238 grammes.

The double working does not, however, give twice the product.

In 1903, the above experiments were made with a larger number of trees.

The period of tapping was, however, remarkably dry.

No. of Tree ...	3	8c	9	25	26	27	28	29	30	31	32	33
Surface tapped M^2 ...	2·2	1·43	2·	1·73	1·43	1·55	1·54	1·39	1·65	1·55	1·52	1·75
Total yield Grs. ...	858	512	810	500	780	487	500	570	877	709	610	910
Yield per M^2 Grs. ...	390	358	405	289	545	314	325	410	532	457	401	520

As no notes were taken of the very dry East Monsoon, unhappily only one tree (No. 3) on which the incisions were reopened only on the lower edge, can be compared with 11 others whose incisions were reopened on both edges.

The yield of tree No. 3 amounted to 390 grammes per M^2 of tapped surface, while as the average of the doubly tapped trees we get 414 grammes.

Albeit a tapping of the upper and lower edge yields more rubber than only working the lower edge, the bigger yield does not, however, cancel the disadvantages of the incisions becoming too broad by a double tapping. They require a considerable time to heal.

If trees, after having been reopened ten times, still yield much latex, it is advisable to continue the tapping a little longer only on the lower edge of the incisions instead of working both edges.

In the years 1903 and 1904, the influence of the temperature variations on the quantity of the yield of rubber was gone into closer.

To that effect the trees taken for tapping from the lot planted in the Gardens in 1883 were divided into three groups.

Each group was tapped at different seasons of the year.

For 1903, the results were as follows:—

GROUP.	I.	II.	III.
Tapped in the month(s) of	Jan.–Feb.	June.	Sept.–Oct.
Rainfall ... M.M.	324	197	379
No. of rainy days ...	14	7	9
Surface tapped ... M²	12·2	9·26	12·4
Total yield ... ... Grs.	7,115	4,318	10,482
Yield per M² surface ... Grs.	583	466	845

In 1904, these three groups, tapped during other periods, gave the following:—

GROUP.	I.	II.	III.
Tapped in the month(s) of ...	Sept.–Oct.	June–July.	February.
Rainfall ... M.M.	711	403	250
No. of rainy days ...	17	13	9
Surface tapped ... M²	12·2	9·26	12·4
Total yield ... Grs.	6,718	4,678	10,697
Yield per M² surface ... Grs.	551	505	863

Inasmuch as both years may be considered wet ones, yet as regards that, no marked difference is shown in the yield of the rubber.

The largest variation of rainy days appears in Group II. In this group, the yield was a little more in the wet year.

In wet years, it does not matter when the *Hevea* trees are tapped.

In normal cases, the best times for tapping generally are at the beginning and the end of the wet seasons.

Tapping during the rainy seasons is accompanied by practical difficulties, as the work is difficult shortly after the rain.

The collection of the latex is difficult as the trunks from the *Heveas* are still wet from the rain water, as from the flowing incisions the latex spreads in all directions of the trunk.

As regards the number of times the incisions can be reopened, no definite figure can be given. In some cases, where after 10 times reopening, the incisions still flow freely, it would be irrational to stop. One taps as long as possible, but after the 15th reopening it is better to stop as the incisions become too broad and require a considerable time to thoroughly close again.

In fixed circumstances, it is possible to continue tapping longer than otherwise.

Temperature and degrees of moisture of the soil may be well considered as the principal factors which influence this.

It may be mentioned that it is not exactly necessary to provide the tin cup with a lip with which to fasten it to the trunk. The experienced worker can fix the cup into the bark of the tree with its sharp edge in such a manner that it will not fall down and likewise is not absolutely necessary to connect the cup and the bark with clay.

In order to prevent coagulation of the latex in the cups and on its way into them, it is advisable to put in them some water beforehand and to put a cup for every two incisions.

If only one cup is used for each vertical row of incisions, the latex flowing from the uppermost incision must traverse too long a way before it settles in the cup.

In this way the latex is subject to evaporation, through which is caused a bigger yield of scrap rubber (that is the product which is coagulated on the stem).

The method of preparation used in our experiments (coagulating with alcohol, drying in air and over unslaked lime) is not sufficiently satisfactory to be used on a large scale.

Therefore, other experiments were made about which will be reported at a suitable time.

THE HISTORY AND DEVELOPMENT OF AGRICULTURE IN THE MALAY PENINSULA.

The history of agriculture in any country and the origin of the plants cultivated there is always an instructive and interesting study. It is often difficult to determine when or how a plant of economic value first found its way into a country and who it was that brought or introduced it. In the history of agriculture in the Malay Peninsula the stories of the origin of the introduction of the most valuable of our cultivated plants, though more or less known to few, are not in accessible records, and many erroneous ideas have been promulgated as to the persons and establishments who should rightly be credited with work the results of which have been of so much importance to the country, and which have so much benefited all who make even a temporary home in this region.

I was the more attracted to research in this direction by reading a statement of an erroneous and misleading nature made by Dr. WILLIS, Director of the Botanic Gardens in Ceylon, in a report recently published on the agriculture of the Federated Malay States. It may be stated that Dr. WILLIS was invited by the present Resident-General of the Native States to visit the Malay Peninsula and Java, and to write a report on the agriculture; unfortunately he was unable to visit the Botanic Gardens in Singapore for more than an hour or two on two evenings and consequently was unable to form any idea of the working of this establishment or to learn what had been done by its means for the development of agriculture in the Native States as well as the Colony for the past thirty years, and thus he gives the Department scant credit for its work, which, as will be seen, has been the basis of the whole of the agriculture of the Peninsula and the mainspring of its development to the present day.

Dr. WILLIS' statement above referred to runs as follows:—

"The majority of the crops at present cultivated in the Malay "States owe their introduction to private enterprise, but rubber was "introduced into the Government Gardens at Kuala Kangsar and a "number of things have come through the Botanic Gardens of Singa- "pore and Penang in the Straits Settlements. Coffee, I believe, is "one of those introductions and the spread of rubber is largely due "to the exertions of Mr. RIDLEY'S Department."

This is all he says about the work done for the Federated Malay Sates by the Botanic Gardens of the Colony. The fiction as to the introduction of Para Rubber into Perak by the Government of Perak, more implied than definitely stated in the report, was exposed in one of the *Agricultural Bulletins*, Straits Settlements and Federated Malay States, some time back. The fact that the Colonial Gardens have for thirty years supplied the Federated Malay States with plants and seeds, and have been constantly utilized by their Government officials and planters in the same way as those of the Colony, though the Federated Malay States have never contributed a cent towards the expenses of the Gardens, is entirely ignored.

As, therefore, there seems to be so much ignorance as to the work done by the Botanic Gardens, and their history, a short account of the development of agriculture in the Malay Peninsula, as far as the facts are at present procurable, may not be out of place in the *Bulletin*. The story is necessarily incomplete, for very few records of what was done in Singapore, Malacca and Penang in the early days have been preserved. If any reports or statements on the subject were ever written, they were either not printed at all, or if printed no copies remain in Singapore, at least, at the present day. The Singapore Library contains barely anything except an incomplete but valuable set of local newspapers and Logan's Journal, printed between the years 1822 and 1880. The archives also of the Singapore Gardens, between 1875 and 1888, are very incomplete. I have, therefore, merely recorded such facts of interest as throw light on the history of the cultivation and introduction of plants, as far as I could procure from these various sources.

It must be remembered, however, that this article is not a review of the work of the Botanic Gardens Department, but merely a review of that part which relates to the development of agriculture in the Colony and the Federated Malay States. The introduction of new and useful plants, their propagation and dispersal to whatever place they could be of use, forms but a small part of the work, extensive though it is. In a properly organized Botanic Garden, experiments have to be made not only with the plants which have proved successful but also with a larger number of plants which may prove failures. Before the Botanic Gardens were founded, planters lost money, often to a large extent, by introducing and attempting to cultivate plants highly recommended as valuable crops in other countries, but which were complete failures in this country. MURTON, for instance, mentions that, before his arrival in the Colony, much time and money was wasted in an attempt to grow the Prickly Comfrey, *Symphytum tuberosum*, a native of the Caucasus, as a fodder plant ; utterly unsuited for this country it failed. Hundreds of other plants, possibly suited for this country, and of considerable value, if successful, have been at different times introduced, and failed to grow satisfactorily. Thus several attempts were made here to grow the opium poppy, and seed was distributed to all parts of the Peninsula. It failed to stand the wetness of this climate, but though the experiment was not successful it was of the utmost importance that it should be tried, for the knowledge that a plant of economic importance will *not* thrive in this country is of nearly as much importance as the knowledge that it will prove successful. For, in these cases, if no profit can be made on the plant, still, there is no need that any money should be thrown away on it, as was too often the case formerly.

Again, the researches in propagation, cultivation and preparation of different vegetable products, the study of the Botany of the country, of the various insect and fungus pests, and the means of combatting them, and the immense mass of correspondence with planters, merchants, enquirers of all sorts, form no small items of the work of a large Botanic Gardens Establishment, none of which labours can be gone into in this paper which simply deals with one branch of the various works of the Botanic Gardens, *viz.*, the part which it has played in the introduction of the more useful plants of cultivation. But it may be mentioned that since the foundation of the Botanic Gardens to the present day, the Federated Malay States have enjoyed the benefits of all these various works of the Colonial Gardens fully as much as the Colony itself has.

Our first records of what was cultivated in the Malay Peninsula dates from the close of the sixteenth century, when the Portuguese were occupying Malacca. At that time and for centuries later what are now known as the Federated Malay States were entirely uncultivated trackless forests, as also were Singapore and Penang. They produced nothing but a little jungle produce and tin and gold.

Malacca, however, was an important port and being often visited by travellers we have some account of its productions. LINSCHOTEN (1583) mentions in his "Voyage to the East Indies", as cultivated plants in Malacca, Mangoes, Cashew-nut (which he says had not long been introduced from America), Jambus (obviously from its description *Eugenia Malaccensis*, "Jambu Bol"), Jambolanes (*Eugenia Jambolana*), Bananas, Coco-nuts, Durians, Betel-nuts, Sirih, Black Pepper, Papaya, Cana fistula (*Cassia fistula*) and the shrub *Nyctanthes arbor-tristis*. Pineapples, he mentions as having been brought not very long previously from Santa Cruz in Brazil to the West Indies and thence to India, and they were almost certainly cultivated in Malacca about that time. Chillies of several varieties were also cultivated in Malacca, then (*Carcia da Orta Historia aromatum*). The only plant, however, which was cultivated at that time to any extent, was Black Pepper, for the export of which Malacca was the great emporium. Rice was, of course, also cultivated, but only, it seems, for local consumption. Indeed it appears that this country, then and certainly later, did not produce enough Rice for its population. It is probable that other plants were introduced during Portuguese occupation, especially some of the fruit trees such as the Jujub (*Zizyphus Jujuba*) and the Sapodilla (*Achras sapota*), but of this we have no definite proof.

No progress seems to have been made under Dutch rule, and indeed agriculture seems to have retrograded somewhat, as it is stated that, under Dutch administration, the natives were actually prohibited from growing Rice.

Arabian Coffee was probably introduced at this time, for it was introduced to Java by the Dutch Governor VAN HOORNE in 1690, (Crawford's Dictionary) and doubtless soon found its way to Malacca.

A number of introduced plants bear in their Malay names the affix Blanda, (Javanese Wolanda, *i.e.*, Hollander), but this does not I think necessarily imply that the plants bearing this name were introduced by the Dutch as the word now at least merely means foreign. "Nona Blanda" (*Anona muricata*, the Sour Sop) and "Chermei Blanda" (*Eugenia uniflora*) are examples. The latter was introduced into Malacca from Brazil long after the Dutch had left the Peninsula.

The next development of cultivation followed on the settling of Penang by Captain LIGHT in 1786. The Island, at that time, contained practically no cultivated plants except a few coco-nuts and fruit trees. Mr. CHRISTOPHER SMITH, the Botanist to the Hon'ble East India Company (1794), was appointed in 1796 to go to the Moluccas to collect spice-plants. He shipped off from there 71,266 Nutmegs, and 55,264 Clove plants and large quantities of seeds of the Canary-nut (*Canarium commune*) and Gomuti Palm (*Arenga saccharifera*). The greater part of these plants were sent to Penang the rest to Kew, Calcutta, Madras and the Cape of Good Hope.

He was appointed sole Superintendent of the Botanic Gardens of Penang, in 1806, and is said to have died there about the same year.

He was also a botanist and collected plants and made drawings of them which are now in the British Museum. Cinnamon and Pepper were also planted in Penang about this time, and from 1803 to 1820 there was a great development of the spice cultivations which continued till 1860, when the destruction of the Nutmeg trees by disease, especially in Singapore, checked the cultivation. In Penang, however, the cultivation never died out as it did further South, but passed into the hands of natives, who maintain it to this day. The descendants of Smith's trees still produce the most valued Nutmegs and Cloves in the world. Gambier was introduced in Penang, in 1807, but it was cultivated to a much larger extent in the mainland.

Thus things remained till Sir STAMFORD RAFFLES, in 1819, founded Singapore. He was one of the few people in those early days who realised the importance of agriculture, and of introducing new and valuable plants. He introduced Nutmegs and Cloves to Singapore as early as 1819 and planted them as well as Cocoa, in the first Botanic Garden in Singapore, in 1823.

He writes to MARSDEN, in January 31st, of that year, "I am laying out a botanic and experimental garden," and to Dr. WALLICH (February 8th), "The Botanic Garden goes on well, I am now employed in laying out the walks, and stones are collected for a handsome hand railway round it" (Memoirs by his widow, pp. 535, 537). This garden was on the slopes of Fort Canning which was then the Governor's residence. A gardener named DUNN had arrived in Singapore previously in 1819, with letters of recommendation from RAFFLES and a supply of spice-plants.

BUCKLEY, in his Anecdotal History of Singapore, Vol. I, p. 74, states that Botanical Gardens were established and that Dr. WALLICH was appointed Superintendent, and that RAFFLES gave him 48 acres more land for the Gardens and Government House ground, and a grant of 48 acres was given from the Government House garden in 1822 to the Superintendent and his successors to the North-East of the hill. This, as will be seen from RAFFLES' letter above quoted, is incorrect. The Gardens were commenced in 1822; Dr. WALLICH, though he doubtless took much interest in the Gardens, was not Superintendent of it, strictly speaking, as he had only come down from Calcutta to recuperate after his Nepal trip and returned to Calcutta, January, 1823. RAFFLES left Singapore in June of the same year. WALLICH seems to have promised to send a Superintendent for the Gardens from Calcutta, but it is not certain whether he did so. The monthly vote for the up-keep of the Botanic Gardens then was 60 dollars. As happened with so many of RAFFLES' plans for the development of the Colony, the Gardens seem to have been neglected as soon as he retired and were abolished altogether in 1829 by LORD WILLIAM BENTINCK, the Governor-General, a man who seemed possessed with the mania of retrenchment. Ten convicts, however, were employed to keep the ground in order (Buckley, p. 206). I have been quite unable to find any trace of this Garden now.

In 1822, the Botanic Gardens at Ayer Hitam in Penang were founded, but I am not sure whether they were on the site of CHRISTOPHER SMITH'S original spice gardens, or when the latter ceased to exist. The Ayer Hitam Gardens were put under the charge of GEORGE PORTER, a schoolmaster with a taste for botany, who sent many specimens of Penang plants to WALLICH, which were distributed in the Wallichian Collections. PORTER remained there in charge till 1834, when the gardens were sold by Governor MURCHISON for 1,250 rupees. The importance of Botanic Gardens in the early part of last century does not appear to have been understood by the Governors of Singapore and Penang, and it is stated that PORTER had some trouble with the Governor, because the latter's wife complained that he did not cultivate enough vegetables for her table, this being the only use conceivable by His Excellency of Botanic Gardens.

With the retirement and death of Sir STAMFORD RAFFLES, progress in agriculture commenced to dwindle and though Dr. OXLEY, and a few other Europeans took a certain amount of interest in the subject, little advance was made in cultivation for many years. Planting certainly increased in some directions under the hands of the Chinese, and also under Europeans, Nutmegs, Cloves, Coconuts, Sugar, Gambir and Pepper were grown to a considerable extent, but only empirically and without the aid of any scientific botanist. The result of this method was shown in the sudden collapse of the Nutmeg plantations in 1860, entailing enormous losses of capital and general despondency. Later again came the devastation of the Coco-nut estates by the two Coco-nut beetles, added to which came considerable losses of money due to various speculations of amateur planters, one of which is mentioned by MURTON in his first Annual Report.

An Agricultural and Horticultural Society was founded about 1837 in Singapore, when Dr. MONTGOMERIE was President, and Dr. OXLEY took a leading part in it. Papers were read on Cotton planting and other subjects, and it is said all the European gentlemen then in Singapore belonged to it. It seems to have died a natural death about 1846, about which time a similar society was founded in Penang under the name of the Agricultural Planters' Association.

In 1859, another Agri-Horticultural Society was founded in Singapore. This was chiefly really a Horticultural Society and commenced the laying out of a portion of what are now the present Botanic Gardens. The Gardens were supported by public subscription, aided by Fancy Bazaars and Exhibitions, but as has often happened in similar societies the subscriptions at last proved insufficient, and in 1874 the Gardens were taken over by the Government. In 1874, Mr. JAMES COLLINS was appointed Economic Botanist and also took charge of the Raffles Museum. He is chiefly known for his work on Rubber published in 1879–1891, and he also started the Journal of East Asia, of which, however, only a single number was published. He made a collection of gums;

resins and other vegetable products, which is now in the Botanic Gardens Museum. He left in 1875.

In 1875, Mr. A. J. MURTON was appointed Superintendent of the Botanic Gardens, and shortly afterwards Mr. WALTER FOX, his Assistant. Mr. MURTON remained in charge till 1879. He introduced a large number of useful, as well as ornamental, plants into cultivation, including Para Rubber, Castilloa, Cera Rubber, Liberian Coffee, Ipecacuanha, and very many other plants. He also studied the local flora, especially giving his attention to Gutta-Percha and the wild rubber vines Willoughbeia, and made botanical excursions into Perak and Kedah, during one of which he planted the first Para Rubber trees in Perak in Sir (then Mr.) LOW'S garden at Kuala Kangsa and at Teluk Anson.

In 1880, Mr. MURTON was succeeded by Mr. N. CANTLEY, who continued the excellent work begun by Mr. MURTON, and in 1884 managed to add to the Gardens a large piece of land known as the Military Reserve, which was forthwith converted into the Economic Gardens. This land, covered to a large extent with scrub, and some Chinese vegetable and Indigo gardens, was a valuable acquisition as the original Botanic Gardens were far too small for the propagation of the useful plants required for the Colony and the Native States which were now beginning to develop.

Although the funds available for opening up this part of the garden were not large, good progress was made. Numbers of new and useful plants were introduced and those previously introduced were extensively propagated and dispersed to various parts of the Peninsula and elsewhere. Mr. CANTLEY published also a list and account of the Economic plants under cultivation in the Gardens, a good deal of his time also was taken up in framing the Forest Department and experimental planting of timber trees. Mr. CANTLEY died in Tasmania in 1887 and was succeeded in 1888 by the present Director (H. N. RIDLEY).

During Mr. CANTLEYS' superintendence, the present Botanic Gardens of Penang were founded and put under the charge of Mr. C. CURTIS in 1884. These Gardens were not only ornamental but supplied a considerable number of useful plants to planters in other parts of Penang, and Mr. CURTIS made also many important contributions to our knowledge of the cultivation of Rubber, Gutta-percha, Sugar, and other useful plants. He retired in 1903.

The small gardens of Malacca at Bukit Sebukor were founded in 1886, on ground presented by a Chinaman, on condition that it should be converted into a garden, and should revert to him if the garden was given up, which happened in 1894, when the Government abolished the Garden. The Malacca Garden was under the superintendence of Mr. ROBERT DERRY. The use of this Garden was simply to supply local requirements in shade and fruit trees and other useful plants necessary for the inhabitants of Malacca, which work it did very well, but besides this experiments were carried out by the Superintendent on Castor Oil, fibre plants, Mauritius hemp, Pineapple, etc., and other useful plants, and the first Para-Rubber trees in Malacca were planted in this Garden. Some time after the abolition of this Garden, a small garden was made at the water works at Ayer Keroh, where a number of useful plants were cultivated, and near the same place plantations of Para Rubber and Gutta-percha were planted. It is interesting to note that the first practical rubber estate started in the Malay Peninsula was made by Mr. TAN CHAY YAN, at Bukit Lintang, in Malacca, in 1896. This planter later opened an estate at Bukit Asahan which is probably the biggest estate in the Peninsula.

Agriculture in the Native States received its first impetus under Sir HUGH LOW, in Perak, in 1876. Teak was planted on road sides, Coffee cultivated on the Hermitage and other hills and Cinchona also tried as well as Tea, some Cocoa, and Pepper.

At Kuala Kangsar, many of the best indigenous fruits were cultivated, Para-Rubber introduced, and one or two plants of Ficus elastica grown as terrestrial plants instead of epiphytes as usually seen.

In some of the gardens, Tea, Coffee, Pepper and some fruits were cultivated on a sufficiently large scale to test their marketable value but with Sir HUGH LOW'S departure nearly all were leased and soon collapsed. The Kuala Kangsar Garden became the depôt of exchange for all the different districts of Perak, all of which were well provided with fruit trees and other economics and this garden has been regularly maintained as the principal Perak Garden. The last garden started by Sir HUGH LOW is on the Taiping Hills, where the tree Tomato and English vegetables are successfully grown.

AGRICULTURAL PERIODS.

The history of the progress of agriculture in the Malay Peninsula may be roughly divided into three periods, both for European and Native cultivations. These periods being marked by the main or large cultivations of each class of cultivators. They are as follows :—

	European.	*Native.*
A.	1800 to 1860, Nutmegs and Cloves.	Pepper and Gambier.
B.	1875 to 1898, Liberian Coffee.	Tapioca and Indigo.
C.	1896 to 1905, Rubber.	Pine-apples.

Sugar and Coco-nuts (European cultivation mainly). Sago and Betel-nuts (native cultivation) were successfully cultivated all through these periods.

The first thing that is noticeable in this is that the European cultivations were all exotic, and that the characteristic cultivated plants were all introduced by the Botanic Gardens of the period: Nutmegs and Cloves, by CHRISTOPHER SMITH in the first Penang Gardens: Liberian Coffee and Rubber by MURTON in the Botanic Gardens of Singapore. Then it is noticeable that the Europeans were never really successful with the plants cultivated by natives nor were the natives ever really successful with those cultivated by Europeans. Two classes of cultivation, however, dropped by Europeans, were taken up by natives. Spices, abandoned by Europeans in 1860, on account of disease, are still cultivated in Penang and Province Wellesley by natives. Pine-apples for tinning, originally cultivated by Europeans, passed very soon into the hands of the Chinese.

The native cultivations always consisted of plants either of local origin or which had long been cultivated often for other purposes in the region. Native cultivators, practically Chinese only, are very conservative, and seldom follow at all on the lines of European cultivation or accept European ideas. An instance of this was the attempt, about 18 years ago, to induce the Chinese vegetable gardeners to grow a better class of vegetables by supplying them with European vegetable seed free. This was done by the Committee of the Botanic Gardens in Singapore. It was a failure. The Chinese either threw the seed away or neglected the plants. It was not till years afterwards that they began to grow Tomatos, and that there is reason to believe from Chinese seed, and still later they commenced to grow Artichokes. Of course, I do not mean to say there have never been natives who have followed European advice to a certain extent. The first cultivator of Rubber was a Chinaman. Mr. TAN CHAY YAN. When Liberian Coffee was grown largely by Europeans, Javanese and other natives had small and usually badly cared-for plantations, but the bulk of the native cultivators stick to the small cultivations which they understand.

The changes in the forms of cultivations above referred to are really our only substitute for the rotation of crops. The system of cultivation in the tropics is to go on cultivating a plant on the same ground till it is no longer remunerative, and then abandon the land, or if necessary start another kind of crop. Fallowing land is unknown, except in the form of throwing back the impoverished ground on the hands of the Government, perhaps for many years, till some one takes it into his head to use it again. Immense areas of land were thus spoilt by the Gambir, Pepper and Tapioca planters, and a good deal after a few years' use has never been touched again for fifty years or longer.

Though most of the land in the Colony which was at one time cultivated and abandoned has never been utilised a second time (for as long as a native planter could lease a scrap of virgin forest he would never apply for a piece of even secondary jungle), now that most of the woodland anywhere near the towns has been destroyed, the previously rejected abandoned land is in many places coming again into cultivation. The old Chasseriau Estate in Singapore is one of the few pieces of land which has really had a regular rotation of crops on it. It began with Tapioca, given up on a fall of prices, then came Cotton, a failure, Coffee which practically failed, then in parts Indigo, Ginger, Chillies and other minor cultivations, and finally is now mostly under Pineapples. It was probably under

Pepper and Gambir before the Tapioca, but of this I have no record. Bad as the stiff clay soil of this area is, the continued cultivation has considerably improved it, and it is an example of what could be done with the waste lands, if natives could be induced to continue cultivating them.

The causes of this compulsory rotation of crops are few in number. The spice-trees were abandoned on account of a disease in 1860. In those days there were no scientific men, nor any Botanic or Experimental Gardens in the Colony where the causes of such diseases could be investigated and means of attacking them be devised, and so serious a catastrophe is hardly likely to be a cause of abandoning a cultivation again. Liberian Coffee was dropped owing to a fall in price of the product. Pepper and Gambier (always grown together) died out on account of the available land being used up, and the exhaustion of the firewood, which was very extravagantly used. Tapioca, which like Gambir is a very exhausting crop, also went off the ground from exhaustion of the soil. Indigo, almost exclusively cultivated in Singapore, was abandoned, mainly on account of the fact that it was necessary to grow it near the town where the dye-works were. The development of the town and demand for building lots practically drove out the dye-houses, which required large supplies of water, only to be had in certain places.

HISTORY OF THE ECONOMIC PLANTS.

BEVERAGES.

Coffee (*Arabian*).—The earliest mention I have found of the cultivation of Coffee in the Malay Peninsula is by Dr. KOENIG in his manuscript account of his voyage in the East in 1779, where he records seeing some in a garden in Malacca. I think, however, it is probable that it was introduced earlier, as it was introduced into Java by VAN HOORNE in 1690, and was probably brought over to Malacca by the Dutch when they first occupied Malacca. NEWBOLD mentions seeing it in Malacca in small quantities in 1833, in his account of Naning, and BALESTIER (Logan's Journal II, p. 141) mentions a few trees growing in Penang in 1848. In these early days, it was chiefly grown in a casual sort of way by natives for personal use and there is no really early record of any attempt to grow it for export, by Europeans till later, when many attempts were made by European planters to cultivate it on a large scale, but being a plant unsuited for this country these attempts were practical failures. It was grown, however, at Waterloo Estate and elsewhere as late as 1902.

The soil and climate, in fact, is not suitable for this plant, and in 1891 (*Agricultural Bulletin*, No. 1, p. 14), I wrote, "I do not think that Arabian Coffee can ever be successfully cultivated in the Straits Settlements." This statement was strongly criticised and condemned as objectionable on the ground that the plant had done well in Perak, and the statement would deter planters from planting it. The cultivation, however, soon entirely failed and it is doubtful if there is an acre of Arabian Coffee cultivated for profit in any part of the Peninsula to-day.

Liberian Coffee.—On the discovery of Liberian Coffee in 1875 and its introduction by Mr. MURTON to the Malay Peninsula the same year, Coffee cultivation became the most important European cultivation in the Peninsula. The plant was discovered in Liberia and Mr. WILLIAM BULL introduced it into England, whence by the assistance of Kew plants were obtained at the Botanic Gardens of Singapore. One of the original introduced plants was growing still in the Gardens in 1890, when it died. Mr. MURTON carried plants up to Teluk Anson, Kuala Kangsa and Larut in 1876, as he didthe Para-rubber trees and also sent plants to Sungei Ujong.

Sir HUGH LOW, who was much interested in the new introduction› reports in a letter to Mr. MURTON, in 1876, that the plants had fruited, but that all the fruits had been stolen. Further supplies, however, were soon forthcoming and very shortly there were widely extended estates all over the Malay States. From the introduction of Liberian Coffee may be said indeed to have originated the agriculture of Selangor, Perak and Negri Sembilan. Besides the European estates, a number of natives, Javanese and Chinese also made plantations of Liberian Coffee and in 1892 I found a small number of plants as far off as the upper reaches of the Tembeling River, where, however, the Malays only used the leaves, of which they made a kind of tea. The leaves of the plant are indeed commonly added to the contents of the tea-pot in Chinese shops to the present day, and at one time there was a proposal to start a Company in Java for preparing Coffee leaves for native consumption: so popular was it.

Liberian Coffee was originally stated to be proof against Hemileia, but did not prove so. The harm, however, that this leaf-fungus inflicted on the plants was almost negligible and when trees were badly affected and injured by it, it was generally considered that the soil was unsuitable and the plant weak and bad. There is still a good deal of Coffee in the Peninsula, and much of it returns a fair to good profit.

It suffered, however, in 1900 in Selangor, from a bad attack of the Caterpillars of the Bee-hawk moth, which nearly destroyed some estates. The fall in price of Coffee, generally due to the vast output of the product in Brazil and the sudden discovery of the planters that Rubber was likely to prove more remunerative in 1898, a fact which attempts had been made to impress on them from 1890 onwards, caused the abandonment of a good deal of the Coffee cultivation in favour of the new agriculture. The Coffee, however, had done its work. It had opened the way to agriculture in the Malay States, brought planters, and money there, and showed that something more could be done with the Peninsula that dig tin and gold out of it.

For this opening of what was unremunerative forest and its conversion into remunerative estates, the Federated Malay States have to thank the first Head of the Botanic Gardens of Singapore, Mr. MURTON. Other Coffee plants were also introduced experimentally by the Botanic Gardens.

Cape Coast Coffee, by Mr. MURTON, in 1875, Maragopie Coffee and a Mauritius variety Caf'Nain by Mr. CANTLEY in 1882 and Coffea bengalensis.

Of these most have dropped out of cultivation from one cause or another, but usually because they did not fruit as well as the Liberian Coffee. Maragopie Coffee, however, is still sometimes asked for though it never seems to have been really disease-proof or come up to what was claimed for it.

Coffea stenophylla was introduced in 1895 from Kew, and distributed as quickly as might be to the Coffee planters. A small berried Coffee of very high quality and fruiting well, it would probably have been largely planted, but for the rise of Rubber cultivation shortly after its discovery. One of the first trees received was given to Mr. W. W. BAILEY of Klang, who tended it carefully, and with much pains and skill produced the grand hybrid between it and Liberian Coffee, of which Dr. TREUB, the Director of Buitenzorg Gardens, stated on seeing it that it would entirely revolutionize Coffee-growing.

During 1900, *Coffea Laurentii robusta*, a very handsome Coffee bush, was introduced. It has hardly had a fair trial as yet, but at present it appears in the Gardens to be a most floriferous plant, but not fruitful enough to please the cultivator.

Nyasa-land Coffee was introduced in 1902, Angola Coffee, a variety of *C. arabica* and Zanzibar Coffee, in 1904.

Chocolate.—The first record I have of the cultivation of Chocolate in the Peninsula is the mention of a tree in a garden in Malacca by KOENIG, in 1779. It is next mentioned in the Life of Sir STAMFORD RAFFLES as one of the trees planted in the ground round the Government House in 1818. THOMSON writing in Logan's Journal in 1850 says that there were a few trees in Singapore at that time. It seemed to be scarce, however, and MURTON reintroduced it in 1877, and supplied Perak with plants in 1879; about 1880, a series of the best Trinidad varieties was introduced to the Singapore Botanic Gardens and some of these plants are still fruiting at the present day.

At one time there was a good demand for Cocoa plants and seed and a considerable number were distributed to various planters. Very little success, however, has attended the cultivation of this plant here. The soil of much of the Peninsula is too poor for it, and it suffers very much from the attacks of fungi and vermin, perhaps worse from the raids on the fruit made by squirrels (tupais) and civet cats, and consequently it has never been a popular plant here. The tree however, often grows and fruits well and fine pods have been frequently shown from the Botanic Gardens trees and from the gardens and estates of private persons at the various agricultural shows.

Tea.—I cannot find that there was any Tea grown in the Malay Peninsula till MURTON introduced both Assam and Chinese Tea in 1877, when he distributed it to Sungei Ujong and other parts of the Peninsula.

Tea gardens were made by Sir HUGH LOW on the Thaiping and Hermitage Hills and those of the latter station produced, under the management of Mr. COCK, a good deal of excellent produce till after the death of Mr. COCK, the gardens were practically abandoned. Tea was grown also successfully in Singapore, Johore and Malacca, for some time, but though the shrub grows with the greatest ease and readiness, almost anywhere, the low price of the product has never tempted planters to lay out estates on a large scale. All the recorded varieties of Tea have been introduced by the Botanic Gardens at one time or another, but the most suitable for cultivation has been the Assam variety. Chinese Tea has seldom done well.

SPICES.

Nutmegs and Cloves were introduced into Penang by CHRISTOPHER SMITH, in 1796, and into Singapore, by Sir STAMFORD RAFFLES, in 1822. The cultivation throve till 1860, when a large proportion of it was destroyed by disease as described in *Bulletin* I, p. 99. It did not die out in Penang and Province Wellesley but passed into native hands.

One or two plantations of Nutmeg remained in Malacca till quite lately, and Mr. ROBERT LITTLE started a plantation of Nutmegs which did very well and Cloves less satisfactory in Singapore some years ago. A few of the old trees of the Nutmeg plantations remained in Singapore till the last few years, but I believe all are gone now.

Pepper was cultivated in Malacca before 1583, and was extensively cultivated in Penang and Singapore, Johore, Perak, etc., till a few years ago, when owing to low prices and especially to the disappearance of Gambir with which it was cultivated, chiefly due to the failure of the firewood supply, the cultivation in Singapore was abandoned.

Cubebs.—*Piper Cubeba* were introduced by MURTON in 1877. The price of the product was then high and the Dutch attempted to keep the cultivation entirely in their own hands. It was impossible to procure stock from them in 1889, though attempts were made to get fresh plants, a few years later, the price fell to so little that the cultivation was abandoned all over the East.

All-spice.—*Pimento acris* were introduced by MURTON in 1877, but as has happened in many other parts of the world, it refused to fruit here, so that the cultivation is practically confined to the West Indies.

Cardamoms were introduced by MURTON in 1875. The plant however, requires some altitude to fruit well, and does not succeed in the plains. Attempts to grow it in Perak or Selangor, in the hill districts where it might do, do not seem to have been made.

Ginger (*Zingiber officinale*), a plant of unknown origin, having never been found in a wild state, was cultivated in Singapore, in 1850, and is still often cultivated in the Colony as also is Turmeric.

TAN STUFFS AND DYES.

Gambir.—The history of the introduction of Gambir into agriculture was published in the first series of the *Agricultural Bulletin* p. 22. The Malays formerly used Cate or Cutch, the product of the Indian *Acacia catechu*, to chew with betel, but this became too expensive, and they used to chew the leaves of a species of *Uncaria*, possibly Gambir, with betel-nut instead (1720); this plant they called Daun Gatta, because it tasted like Cate' and Gatta Gambir (the latter word a perversion of Krambu scented).

Before 1750, they discovered the way of making cakes or lozenges of the extract to replace the expensive Indian Cutch. In 1758, seed was obtained in Johore and later, plants, and these were taken to Malacca, where plantations were formed to such an extent that the price of the Gambir cakes fell to less than a quarter of their original price. It was cultivated by Chinese and Malays in Penang, in 1807 and introduced to Singapore, in 1819. In 1820, it began to be exported to China and Java as a dyeing and tanning agent.

Its cultivation was confined to the Colony and Johore, very little being grown in other parts of the Peninsula, but a good deal also was grown in the Dutch Islands.

The cultivation has always been in the hands of natives, the export Gambir being made almost if not quite exclusively by the Chinese. The Malays cultivated it only for local consumption. Europeans here hardly ever paid any attention to it, and I doubt if there has ever been a really European plantation.

I am by no means certain as to the original wild habitat of *Uncaria Gambir*. It can often be seen long persisting in woods which have grown up over abandoned cultivation, but I have never seen it undoubtedly wild anywhere. RUMPHIUS gives descriptions of three species of *Uncaria* from Amboina, Celebes and Palembang, but it is doubtful whether any of these are the real plant. Its use as a tan stuff was undoubtedly discovered by the Chinese.

"Terra Japonica", an old name for Gambir, is mentioned among goods sent as tribute to China in the history of the Ming Dynasty (1368–1643), but this was probably Indian Cutch.

Divi-Divi, *Caesalpinia coriaria*, the pods of which are used for tanning, was introduced to the Malay Peninsula by MURTON in 1878. It was cultivated to some extent in Singapore at least till about 1890, but its cultivation has been abandoned as the trees did not produce enough pods in proportion to the ground it took up.

Log-wood, *Hæmatoxylon campeachianum*, introduced at the Botanic Gardens, Singapore, has never been cultivated. It is of slow growth, and is not sufficiently remunerative.

Indigo appears to have been cultivated in Penang about 1848, introduced probably from Java by natives and later on a fairly large scale in Singapore, till about 1902, when its cultivation began to die out in Singapore. It was only made in a liquid condition and carried in baskets lined with paper to the dye works, so that it could only be cultivated profitably near a town. It was never made into cakes for export, nor did it seem possible to do so. Experiments in this direction were made at the Botanic Gardens and by the Government Analyst in 1893, but they were practically failures. The demand for land near town, and the opening of the railway caused the disappearance of the cultivation. It was essential that the dye works should have a good supply of running water and when the land they occupied was required for building and the railway several of the dye works closed down, and have not been reopened, and consequently the Indigo cultivation has almost entirely disappeared.

Sappan-wood, *Cæsalpinia Sappan*, a native of the Malay Peninsula, used in dyeing red. It is seldom cultivated, but has been an article of trade for some hundreds of years.

Marsdenia tinctoria, a climber producing Indigo introduced from Sumatra, probably very early by the Malays, was formerly to be seen in Chinese Indigo fields, here and there, but no one seems to have known how to utilize it, and it has almost entirely disappeared.

DRUGS.

Comparatively few have been cultivated in the Malay Peninsula to any extent.

Ipecacuanha was first introduced by MURTON in 1875 from Ceylon and later, 1876, from Australia and on several other occasions at still later date. The first attempt to cultivate it was in Sungei Ujong in 1877. It was later cultivated in Johore at Pengerang estate and is still in cultivation at Klang. Mr. BAILEY, who grew it at both these last two estates, seems to be the only planter who has ever been successful with it. The Malay Peninsula drug has always fetched good price.

Croton-oil seed was introduced in 1882 and possibly earlier. It was formerly cultivated to a small extent on several estates, and is now occasionally asked for. The demand, however, is very small.

Balsam of Peru, *Tolnifera balsamum*, was introduced in the Botanic Gardens, Singapore, in 1882. It thrives well though rather a slow grower. The finest trees I have seen are at Perseverance Estate, Singapore.

Nux-Vomica, *Strychnos Nux Vomica*, was introduced in the Botanic Gardens, in 1879. The plant is a slow grower and has never fruited.

Sarsaparilla, from Jamaica, was introduced in 1888; some years later, roots were sent home for report, which was that the roots were too small, otherwise suitable.

Tamarind.—*Tamarindus indicus* no doubt found its way here many years ago but whether regarded as a dye, drug, or condiment the local supply is furnished by Indian bazaars.

Cola acuminata and *C. vera.*—The Cola-nuts were introduced in 1881 and not soldom sent to the Native States. *Cola acuminata* has been cultivated for many years in Johore and Negri Sembilan, and has fruited well in both places. There are, however, only a few trees scattered about the Peninsula.

Brucea sumatrana, "Kosam," was first obtained by Dr. WALLICH in Singapore, where it still exists in a wild state, though very scarce owing to the ground it inhabited being built on. It had practically disappeared from the Colony when MURTON reintroduced it from Hongkong, in 1875, and I reintroduced it again from Pahang in 1890; since then, considerable attention has been called to it as a drug for dysentery and a large number of plants were propagated in the Botanic Gardens, and seeds distributed in 1901 to all the District Officers in the Federated Malay States (although the plant is quite common in the Federated Malay States) and elsewhere, and a quantity sent to India and other parts of the empire. Reports of experiments made with it have already been published in the *Bulletin.*

Ocimum viride, the "Mosquito-plant," obtained a great notoriety in 1903 as a deterrent of Mosquitos in Central and West Africa. The Botanic Gardens Department, having several valued correspondents in Tropical Africa, had no difficulty in getting two lots of seeds within a couple of months of the publication of the supposed use of the plant. These were cultivated and seeds from them were distributed to all parts of the Malay States and elsewhere in six months.

The plant proved useless, but the rapidity with which the plant was obtained, propagated and freely distributed all over the Peninsula illustrates the value of building up and keeping up an extensive correspondence with all parts of the world. It is said that another Botanic Garden, less fortunately supplied with correspondents, only obtained 12 seeds from a dealer at a high price by the time that the plant was being distributed in quantity all over the Peninsula.

Coca, *Erythroxylon Coca* and *E. novo-granatense*, was first introduced by MURTON in 1875, and several forms at a later date. It grows with great ease and rapidity, and being very prolific is very quickly propagated. It has been supplied to a large number of estates in the Malay Peninsula, and is now scattered about everywhere. The demand for the leaf is small, however, and the plant is so readily grown that it is seldom really remunerative.

Cinchona.—The Quinine trees were introduced by MURTON in 1878, (*Cinchona officinalis*), (*C. calisaya*) in 1879 as well as other species. Sir HUGH LOW also procured *C. succirubra* from India, and tried it at the Hermitage, Waterloo Estate, and on Thaiping Hills. The result, however, proved a failure. The plants grew to bushes, seeded freely and on the Thaiping Hills became naturalized, but failed to reach the stage suitable for supplying bark. I lately found also a fair-sized tree presisting in the old Gunong Pulai Estate in Johore which has been long abandoned.

RUBBER.

Para Rubber (*Hevea braziliensis*).—An account of the introduction of this plant to the Malay Peninsula was published in the *Agricultural Bulletin*, Straits Settlements and Federated Malay States, New Series, Vol. II. p. 2. Mr. COLLINS, above mentioned, was the first to obtain seeds in Brazil, which were shipped through Mr. CLEMENT MARKAM to Kew. The few that survived the journey were sent from Kew to Calcutta, where they failed. The next lot, received from Mr. WICKHAM, went to Ceylon (1876) and 50 plants were sent to Singapore, where by delay at the docks they perished; next year 22 plants arrived safely at the Botanic Gardens, and Mr. MURTON took 9 plants to Perak for Sir HUGH LOW. Much later some more seed was received from Ceylon and grown in the Botanic Gardens. The plant seems never to have been successfully introduced again from South America, and it may be said that all the Para Rubber trees in the Malay Peninsula and indeed all in cultivation in Africa, Asia and Australia are descendants of the seed introduced by Kew through WICKHAM, and further more all the trees in the Malay Peninsula, except such as have been lately introduced from Ceylon, were derived from the Botanic Gardens of Singapore, which Department has also supplied most, if not all, the plants cultivated in Africa, Mauritius, Seychelles, Borneo, Sumatra, Java, Australia, New Guinea, Polynesia, Hawaii, Mexico, Cochin-China and other countries.

Though there were a few estates in the Peninsula like Linsum and Kamuning, which had Rubber plantations, no cultivation commercially was undertaken till 1896, when Mr. TAN CHAY YAN was induced by the Director of the Botanic Gardens to plant Rubber, which he commenced to do at Bukit Lintang, in Malacca, and later opened up a much bigger estate at Bukit Asahan, said to be at present the biggest Rubber estate in the Peninsula. Other planters followed suit in 1897, and the success proved so great that new estates are being started every week.

There was no reason why this cultivation should not have been started many years previously. Planters had been strongly advised to turn their attention to this plant, seed was freely distributed from the Botanic Gardens to any who would take it, and samples of prepared Rubber from the Gardens, trees were shown at all Agricultural Exhibitions, but attention was then entirely fixed on Coffee, and an unfortunate error made by a Resident of Perak, caused not only delay in the cultivation but destruction of some of the finest trees in the Peninsula. Some Dyaks had been requested to extract Rubber from the Para trees, and not understanding the work failed and declared that the trees were worthless. A number of these trees which had been planted by Sir HUGH LOW, at Kuala Kangsa, were on this report destroyed, and no planters could be induced to pay any more attention to it till 1896.

Castilloa elastica, the Panama Rubber, was introduced to the Malay Peninsula by the Botanic Gardens of Singapore, in 1876. The climate is, however, unsuited for this plant, and it usually falls a victim to the attacks of the beetle (*Epepseotes luscus*).

Manihot Glaziovii, Ceara Rubber, was introduced also by the Singapore Botanic Gardens, and plants were planted in Perak by Mr. MURTON, in 1876.

Mr. MURTON did not believe in the suitability of the plant for this climate, as prolonged wet destroyed it, and he pointed this out in his Annual Report in 1878. In spite of this, a mania arose for planting it some years later, with the expected result of its perishing. Good trees, however, persist in many parts of the Peninsula and in Borneo, but no one now would attempt it on a large scale. One big tree in the Singapore Botanic Gardens fruits constantly and its seeds have been sent to many parts of the Peninsula and to other parts of the Peninsula and to other parts of the world and the large tree at Kuala Kangsa flourish still or did till quite lately but produces too little latex.

Hancornia speciosa, the "Mangabeira" Rubber of Pernambuco was introduced by the Singapore Gardens in 1882. It perished however, and attempts to procure it again have failed. It is apparently a very troublesome plant, both seeds and plants travelling badly. It is an inferior Rubber and is suited only for dry regions. I have seen it on the sandy heaths of Pernambuco, where it grows as a small tree like a birch.

Mascarenhaisia elastica was introduced by the Botanic Gardens, being received from Kew in 1898. It grows steadily, but not very fast except at first. It flowered early and fruited this year.

Kickxia (*Funtumia*) *africana* was introduced from Kew, by the Singapore Gardens in 1897, and *Kickxia elastica*, the following year. The latter has not proved much of a success in any part of the Peninsula, being much attacked by the caterpillar of *Caprinia conchylalis.*

Landolphias.—A large number of the Rubber vines of Africa have been introduced by the Botanic Gardens, Singapore, chiefly received from Kew and the better class ones distributed to various parts of the Peninsula, Borneo, etc.

Landolphia	*Watsonii* in	*1881*
,,	*Petersiana*	*1881*
,,	*Kirkii*	*1881*
,,	*Florida*	*1882*
,,	*Klainei*	*1900*
,,	*Senegalensis*	*1897*
,,	*Owariensis*	*1897*
,,	*sp. Trinidad*	*1898*

Willoughbeias, etc., the Malayan Rubber vines, were brought into cultivation by MURTON, CANTLEY and myself and widely distributed to all, who would try them. About a dozen kinds were cultivated at the Singapore Botanic Gardens, including *Willoughbeia firma, flavescens, Urceolas,* several species, *Chilocarpus* and *Melodinus. Willoughbeia edulis* was introduced from Assam, in 1898.

Gutta Percha, the native *Dichopsis gutta,* was brought into cultivation in 1877, by Mr. MURTON, who collected a quantity of plants in Perak and elsewhere. There were, however, several old trees in the Botanic Gardens' jungle which still persist.

Dichopsis krantziana, of Saigon, was introduced in 1898 and *Dichopsis calophylla,* from Sumatra in 1898.

Payena Leerii, the tree "Gutta Sundik," from Sumatra, was introduced in 1898 and the local species distinguished from *P. Leerii* by PIERR was brought to the Gardens some time before. Balata (*Mimusops globosa*) was introduced first in 1885. The trees have made but a poor growth for their age.

SAGO.

The orginal home of the Sago palms is probably in the Moluccas. Its cultivation is recorded from "Fanfur" apparently some part of Sumatra and probably Kampar by MARCO POLO, in 1298. The invention of converting the flour into Pearl Sago, was made by the Chinese about 1815. It is not clear when the plant was introduced into the Malay Peninsula, but probably very early in Malacca. KOENIG saw it there in 1779, LINSCHOTEN in 1583, does not mention it in the East Indies, but the early voyagers were more interested in drugs and spices than in local foodstuffs and so perhaps does not notice it.

Owing to its requiring low swamps for its cultivation, it is seldom to be seen in large areas, but rather in patches. It is scattered thus all over the Peninsula, and forms an important article of export.

TAPIOCA.

The Tapioca-plant seems to have been introduced early, but at what date I cannot determine. It is not mentioned by LINSCHOTEN (1583) or KOENIG (1779), but the first record of it I have is in 1848 where it is mentioned as cultivated for food only by LITTLE and BALESTIER (Logan's Journal), together with sweet potatoes and *Colocasia antiquorum.* It appears to have been first cultivated on a big scale for making Tapioca-flour, in Malacca, about 50 years ago by the VELGE family, and has continued in cultivation there ever since.

Mr. CANTLEY introduced, about 1886, a number of South American varieties which were distributed to various growers, as well as to the Malacca Gardens.

SUGAR.

Sugar appears to have been cultivated very early in Province Wellesley. It is said indeed that there were Chinese plantations there before the colonization of Penang. Sugar was exported from

Penang in 1805, but this seems to have been mainly Batavia Sugar. The date at which sugar was introduced into the Malay Peninsula is lost in antiquity, but probably not later than the first occupation by the Portuguese.

Many varieties were introduced by the Botanic Gardens in Singapore. MURTON introduced 20 varieties in 1878 and more next year and distributed cuttings to Province Wellesley, Perak, Kedah and other parts of the Peninsula; CANTLEY introduced 44 varieties in 1883 and 56 about 1888 and other varieties were introduced from time to time; CURTIS, in 1898, raised a quantity of cane from seed and distributed it to Province Wellesley and Perak.

The chief cultivation for Sugar-making has always been in Province Wellesley and Lower Perak, but eating cane is cultivated everywhere.

FIBRES.

A great deal of work connected with plants possessing commercially useful Fibres was done at the Botanic Gardens, not only by introduction of useful plants but by experimenting with them. Among the plants of this group introduced by the Botanic Gardens are:—

Green Aloes.	*Fourcroya longæva*	1879
	F. gigantea	1882
	F. macrophylla	1897
Raphia Fibre.	*Raphia Ruffia*	1876
Manila Hemp.	*Musa textilis*	1876
Agaves various		1881 & later
Sanseviera	*zeylanica*	1879
S.	*guineensis*	1879
S.	*cylindrica*	1879
and many other species till		1904
Cuba bast	*Paritium elatum*	1879
Urera tenax		1893
Musa Malaccensis		1893

Cotton was introduced much earlier and a history of its cultivation has already appeared in the *Bulletin*, but many, in fact most of the known strains, were obtained, cultivated and distributed to different parts of the Peninsula from the Botanic Gardens.

FODDER GRASSES.

A great many fodder plants were introduced and experimented with at different times, including Teosinte (*Euchlæna luxurians*) 1879. *Panicun spectabile* from Kew, 1880, Guinea grass 1876, and others,

VEGETABLES.

Most of the vegetables regularly cultivated are of native origin. English vegetables were introduced many years ago by Dr. OXLEY, and later by MURTON, and vegetable seed was also introduced on very many occasions later by the Botanic Gardens' Directors. The

Cho-cho, *Sechun edule*, was reintroduced by the Penang Garden in 1886, Water cress also in 1883, True Lima beans, 1884, and Artichokes, Tomatos (various strains), Capsicums of various kinds, and many other vegetables were introduced from India and Italy and distributed from the Botanic Gardens.

BAMBOOS.

In 1886, Mr. CANTLEY noticed the absence of serviceable bamboos in Singapore and introduced among others *Dendrocalamus strictus*, the male bamboo, *D. giganteus*, *Bambusa vulgaris*, var. The few native bamboos here, *Schizostachyum*, two or three and *Bambusa Ridleyi* are of little value. *Dendrocalamus*, *flagellifer* so much cultivated for its edible shoots and *Gigantochloa* sp. the shoots of which are also eaten, may have been introduced from Java by the natives, but as both of these are serviceable bamboos, it is probable that they were not in the country in 1886. Since that time, there has been no lack of ornamental bamboos, and many were sent to different parts of the Malay States, which are very poor in useful bamboos.

TIMBER TREES.

A large number were introduced by the Botanic Gardens including Teak, Mahogany (both kinds), *Carapa Guianensis*, *Hymenæa Courbaril*, *Eucalypti*, many species, Brazil iron wood, Kauri pine (1879).

FRUITS.

The following fruits were in cultivation before 1875:—

Banana
Durian
Rambutan
Mangosteen
Duku
Pineapples
Jambu bol
Champedak (1848)
Jack Fruit (1850) THOMSON in Logan's Journal, IV.
Orange (1850)
Bachang ,,
Eugenia aquea ,,

Bilimbings (1850)
Pulasan ,,
Rambei ,,
Namnam ,,
Pumelo ,,
Rukam ,,
Chiko ,,
Papaya ,,
Pomegranate ,,
Anona squamosa
A. muricata
A. reticulata
Tamarind ,,

All the rest seem to have been introduced later and where not otherwise stated were introduced by the Botanic Gardens, Singapore.

The Durian is first recorded from Malacca by GARCIA DA ORTA and LINSCHOTEN, in 1583. Its place of origin is doubtful. I certainly do not think it is a native of the Peninsula as I have never seen it wild anywhere. There are, however, a number of species of the genus wild in the Peninsula and the adjacent islands. It is mentioned as occurring in Sumatra in Chinese literature of the date of 1416, (Groenevelot verhandlingen van het genootschep en Wetenschappen XXXIX).

The Mangosteen is also not wild so far as I have seen in the Peninsula, but is described by the earlier travellers from 1416. I believe it has never been found in a wild state anywhere. But like Durians there are wild species.

The Rambutan is probably a native of the Peninsula.

The following fruits also occur in a wild state in the Peninsula:—

Kechapi (Sandoricum radiatum), Bachang (Mangifera fœtida), and Binjai (M. cæsia), Champedak (Arto carpus polyphemia), the wild form of which contains a much smaller amount of pulp in proportion to the number and size of the seeds, shewing that the Malay cultivators have improved this fruit by careful selection, Rukam, (Flacourtia Rukam). I am doubtful, however, about the *Flacourtia Cataphracta*, the most popular of this genus, as I have never seen it wild, the Rouminiya *Bonea microphylla*, and possibly *B. macrophylla*, the Langsat, *Lansium domesticum*, of which the Duku is a cultivated and improved form probably originating in Java. The first mention of the Pulasan I can find is in Newbold (1839), who also mentions the Rambei *(Baccaurea motleyana)*. I am doubtful as to either of these plants being indigenous to the Peninsula, but they are certainly natives of the Malay region and were probably brought from Java or Borneo by natives much earlier than this.

Pineapple.—Of strictly exotic fruits, the first to mention is the Pineapple. This is first mentioned as occurring in the East by LINSCHOTEN in 1583, as quoted above. He does not directly mention its occurrence at the time in Malacca, but it was doubtless there about that time; very easily grown and carried about, it reached the other parts of the Peninsula as soon as they were colonised. At first grown for its fruits only for local consumption, the Chinese in Singapore, in about 1870 started working the fibre from the leaves, but as apparently this became insufficiently remunerative, this manufacture dwindled till in 1888 only a few Bugis in Singapore were left, who extracted the fibre and these men ceased the manufacture soon after. The Bugis also in the early days used to make an intoxicating drink from the Pineapples, but only for local consumption.

Pineapple cultivation then decreased till some European firms commenced the canning industry, but there was no great development of this till about 1890, when the Chinese commenced the business. Then, there began a great demand for Pineapples owing to the starting of many Chinese factories. At first, the canning houses increased so fast that many failed from lack of sufficient pines, but pine cultivation quickly took the place of the dying Pepper and Gambier industries, and later supplanted to a large extent the Indigo cultivation. Large areas of land formerly under these latter cultivations, which have been abandoned and left a weary waste of lalang and secondary scrub were now put under Pineapples, and what was less satisfactory most of the remaining bits of forest near Singapore were destroyed for this cultivation. The Canning industry increased rapidly to the present day. The European firms, however, have almost, if not entirely, dropped out of the business which is entirely in the hands of the Chinese. Outside the island very little canning is done, though there are a few small factories in Penang and elsewhere. The pines used for canning are of poor eating varieties, but serve their purpose for preserving very well.

Many good table pines have, however, been introduced by the Botanic Gardens of Penang and Singapore, among which may be mentioned the Mauritius pine; Black West Indian (1893), Aba caxi (1893), Windsor (1893), Guatemala spineless; Harvey's Mexican and the Elvaston pine, Red Spanish, Green Ripley, Red Ripley, Ruby pine from Jamaica and others at various dates.

The Papaya.—This South American fruit was cultivated in Malacca as early as 1583 (LINSCHOTEN) having been introduced from America by way of Manilla, by the Portuguese; several varieties of more or less value have been lately introduced by the Botanic Gardens of Singapore. The Papayas of Singapore are considered by connoisseurs to be the finest in the world.

The mountain Papaya (*Carica Cundinamarcensis*) has several times been introduced by the Botanic Gardens, and attempts have been made to grow it on our hills in Perak and elsewhere, but it has always failed, the altitudes being apparently not great enough.

Bananas are recorded as cultivated in the Malay Peninsula as early as 1416 (Chinese Literature), and were probably under cultivation at a very much earlier date, as I have very little doubt that the wild plantain of the Peninsula forests, known as Pisang Karok (*Musa Malaccensis*), is the parent of a number of the varieties of cultivated plantains. A great number of named varieties have been cultivated in the Botanic Gardens, derived from many different parts of the world and are often in request and distributed. The fruit of the wild form above mentioned is yellow and full of hard seeds. In size, coloring and shape it resembles the fine cultivated variety known as Pisang Mas, but that is stoneless and very highly flavoured. A Banana, with abortive seeds in it, Pisang Batu, is often cultivated by the Malays. West Indian cooking Plantain were introduced by the Botanic Gardens, in 1893.

Oranges were cultivated in Singapore, in 1850 (THOMSON in Logans's Journal Vol. IV), and probably earlier; many varieties were obtained later. CANTLEY introduced a number of Australian kinds in 1881, some of which were sent to Perak, and good strains were introduced by the Botanic Gardens, from India, Florida and Malta and other places. Orange cultivation is, however, unsuited for the greater part of the Peninsula, though good samples are usually shown at the Agricultural Shows. The soil of the country and especially the dampness of the climate are against the cultivation. They do better in Malacca where it is drier, and on an alluvial flat at Kuala Kangsar, at the mouth of the Kangsar River in Perak, the oranges are excellent, but most of the West Coast of the Peninsula has failed to produce good Oranges or Lemons.

Pumelos were also cultivated very early, before 1850. The Bali pumelo, one of the best varieties, was introduced by Sir HUGH LOW, and later again by the Botanic Gardens, Singapore.

Limes of many varieties have been in cultivation for many years probably many centuries, and other good and distinct varieties were introduced by the Botanic Gardens, Singapore, and Sir HUGH LOW introduced a fine lemon-shaped form, about 1878, which is still cultivated at Kuala Kangsar and at Kamuning Estate. No attempt has been made in the Straits to prepare lime juice or citric acid from the fruit as is done in the W. Indies. And though a most important fruit in tropical regions, its cultivation for local consumption has been much neglected in the Federated Malay States.

Lemons, from Malta, were introduced by the Botanic Gardens in 1888, fruited in 1889 in Singapore, Malacca and Penang, but the climate hardly agreed with the plant, and they died out not long afterwards.

The Jamaica Grape fruit was introduced by Mr. R. DERRY in 1900, but appears not to be sufficiently advanced for distribution. It was planted at Kwala Kangsar.

Brazil-nut, *Bertholletia excelsa*, introduced into the Botanic Gardens Singapore, in 1881, fruited first, 1902, and continues to fruit each year.

Otaheite Chestnut, *Inocarpus edulis*, introduced in 1876, fruits regularly.

Litchi, *Nephelium Litchi*, introduced in 1879 by MURTON. There are big trees in Singapore, but it has never flowered here.

Butter-nut (*Caryocar nuciferum*), introduced by the Botanic Gardens, 1898, has not yet fruited.

Mamme apple, *Mammea Americana*, introduced, 1886, has never fruited.

Vanguiera edulis, introduced, 1889, regularly fruited, but the fruit has no charms except for natives.

Spondias mangifera, introduced 1882.

Avocado Pear, by MURTON, 1877, have often fruited, the latter well.

Loquat, (*Eriobotrya Japonica*), introduced by CANTLEY, commonly flowered, but never set fruit.

Apples.—An attempt was made in 1885 to cultivate several of the European fruits on the Penang Hills, where a small garden was formed for these plants; among them apples were introduced and fruited scantily in 1886 and later. The fruit was of good quality.

Olives were introduced at the same time, but though the trees grew to a good size, never fruited.

Peaches, introduced 1885, fruited, 1886, and Mr. CANTLEY expressed a hope that, in a few years, these fruit would be commonly sold in the markets, a hope destined to disappointment.

Figs, introduced, 1886 and 1888, have made but slow growth, but have fruited from time to time giving fairly good fruit, but rather flavourless.

Grapes.— The vine was probably introduced in Portuguese times, and frequently since. It has never been really successful, though grapes, of the style known as sweet-water, were fruited formerly in Singapore on one or two vines.

The heavy rain storms of the Peninsula militate much against its growth.

The Saigon Vine, *Vitis martini*, was introduced in 1888. It grows well and fruits heavily, but the grapes are poor, and hardly eatable. An attempt was made to make wine of it in French Indo-China, but the verdict of the connoisseurs was that the wine was detestable.

The Blackberry, *Rubus fruticosus*, was introduced in 1891, and failed to fruit, though it grew well at first. Mr. CURTIS introduced to Penang Hill an Indian species with black fruit, which did very well, for some years, and also the *Rubus rosæ folius*, an orange fruited species from the hills of the Peninsula, which has several times been in cultivation in Singapore. Another Rubus from Uganda said to bear good fruit was introduced into Singapore Botanic Gardens, in 1904. It has not fruited yet. The trouble with these Blackberries consists in the difficulty of preserving the fruits from the attacks of birds which plunder the bushes.

Mangos.—Many good strains were introduced from all parts of the world and distributed, the local strains being very poor.

Barbados cherry (1888), Eugenia uniflora, E. braziliensis and E. Pitango.—The tree tomato (*Cyphomandra betacca*, which fruits well on the Perak Hills, and many other small fruits were introduced also by the Botanic Gardens, Singapore.

From the above account of the introduction of the various plants most commonly cultivated in the Malay Peninsula, it will be seen that the statement that most important plants have been introduced by private persons is altogether erroneous. The plants of common tropical cultivation, it is true, found their way into the uncultivated parts of the Malay Peninsula, often, hundreds of years ago, but by whom and how is quite unknown. Many, perhaps, came quite accidentally. Of the rest of the important exotics, nearly every one was introduced, cultivated, propagated and dispersed to various parts of the Peninsula by the Botanic Gardens of Singapore and Penang. These Gardens were maintained out of Colonial funds only, but as it was clear very early that the Malay States would eventually be the main agricultural district of the Peninsula, these States, as they were gradually developed, were assisted by the supply of plants, and information to the fullest possible extent, by the Colonial Gardens at no cost to the Government of the Malay States.

Sir HUGH LOW, whose various Gardens in Perak were supplied mainly with plants from the Botanic Gardens in Singapore attempted to develop agriculture in Perak, but his work was practically abandoned after he left the country and little was done for Agriculture in the Federated Malay States except by the Colonial Gardens, till the present year, and indeed at present the Malay States are still utilizing the resources of the Colonial Gardens.

It can thus be seen what a large debt the agriculturists of the Malay States owe to the Botanic Gardens of Singapore and Penang for the work done for the last thirty years. Debts are easily forgotten, and the names even of the founders of agriculture in the Peninsula are perhaps hardly known to the planters who are reaping the benefit of their labours, among whom should be remembered CHRISTOPHER SMITH, to whom we owe the Nutmegs and Cloves of Penang. A. J. MURTON, the introducer of Para rubber and Liberian Coffee, and many other useful plants, and N. CANTLEY, who opened up the Economic Gardens in Singapore, whence so many thousands of plants and seeds have since been distributed over the Malay Peninsula.

H. N. RIDLEY.

FORESTRY IN THE MALAY PENINSULA IN 1904.

The following notes extracted from the annual report from the Forest Department for last year may be of interest to our readers. Under the heading "Natural Reproduction" Mr. BURN-MURDOCH writes:—

In Selangor, Merbau seeded plentifully during the year and thousands of seedlings were observed in the Ulu Langat district; Penak also seeded well both here and in the Kwala Pilah district of Negri Sembilan.

A few Gutta-percha seeds, *(Palaquium oblongifolium)*, were obtained from Mr. HARPER, some of whose coolies came across fruiting trees in the remote jungles. The natural regeneration of Palaquium is very good. The Dipterocarp family fruited well generally, especially in Negri Sembilan, and large quantities of Penak, *(Balanocarpus)*, seed were collected. The following were noted to have fruited:—

Balanocarpus maximus	...	June to August.
Kumus *(Shorea ciliata)*	...	October.
Meranti and Serayahs	...	
Shoreas of various species and Hopea	...	July to August.
S. Acuminata		
S. Oprosula		

Menyak Keruing, *Dipterocarpus crinitus* and *Hasseltii.*	
Calophyllum spectabile	August to September.
Petaling *Ochanostachys Amentacea*	July to September.
Tembusu, *Fagroea fragrans*	November
Merbau, *Afzelia palembanica*	

Palaquium was not observed to fruit in Negri Sembilan.

It is interesting to note that in the forests near Tertang, Jelebu, the various ages or girth classes of Penak and Merbau are well represented, quite in contrast to parts of Pahang and Kwala Pilah where there are but few poles and saplings.

Both Merbau and Chengal seeded well in Pahang, but seedlings are reported as scarce in a more advanced age. Resak *(Shorea barbata)* in the Temerloh district and Giam in the Rompin district have reproduced themselves satisfactorily, and seedlings of both species were seen thriving. The reproduction of shoreas was good.

REGISTER OF RAINFALL AT NEGRI SEMBILAN HOSPITALS, FOR JUNE, 1905.

Date.	Seremban.		K. Pilah.		Tampin.		Jelebu.		Port Dickson.		Mantin.	
	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.
1	...	85	...	...	...	...	...	22	...	...	...	02
2	...	06	...	20	...	...	...	31	...	...	...	10
3	...	...	...	...	...	...	...	17	...	...	...	...
4	...	...	...	12	...	...	...	14	...	...	...	18
5	...	22	...	06	...	...	...	80	...	...	...	52
6	...	...	...	...	...	...	...	05	...	...	...	...
7	...	18	...	...	...	...	...	...	...	...	...	17
8	...	11	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	02
10	...	...	...	...	...	...	...	...	...	06	...	...
11	...	23	...	...	...	38	...	05	...	...	...	13
12	...	...	...	02	...	...	...	...	...	...	...	...
13	...	12	...	...	...	40	...	...	...	47	1	05
14	...	...	...	02	...	...	...	40	...	42	...	27
15	...	...	...	...	...	...	...	...	...	04	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...
17	...	45	...	...	...	...	...	06	...	...	...	87
18	...	...	...	...	...	45	...	...	...	83	...	...
19	...	...	...	...	...	...	...	...	1	29	...	...
20	1	11	...	40	...	24	...	05	...	...	...	14
21	...	10	2	24	...	...	...	...	1	85	...	11
22	2	35	...	10	...	...	...	38	...	...	1	29
23	...	...	...	...	...	...	1	77	...	...	...	...
24	...	...	...	...	...	16	...	07	...	88	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	06	...	...
27	...	...	...	...	...	...	...	...	...	...	...	13
28	...	...	...	...	...	...	...	88	...	...	...	27
29	...	...	...	...	1	15	...	20	...	...	...	14
30	...	...	...	...	...	...	...	01	...	44	...	03
Total	5	78	3	16	2	76	5	56	6	34	5	44

State Surgeon's Office, Seremban,
13th July, 1905.

R. VAN GEYZEL,
Apothecary.

SINGAPORE MARKET REPORT.

July, 1905.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	...	...
Bali	...	21.62½	21.00
Liberian	147	23.50	22.50
Copra	6,081	7.90	7.10
Gambier	2,549	9.00	8.65
Cube Gambier, Nos. 1 & 2	225	12.75	12.00
Gutta Percha, 1st quality	...	300.00	150.00
Medium	...	200.00	90.00
Lower	...	80.00	12.00
Borneo Rubber 1, 2, and 3	...	140.00	90.00
Gutta Jelutong	...	7.37½	7.12½
Nutmegs, No. 110's	...	38.00	37.00
No. 80's	...	60.50	58.00
Mace, Banda	...	85.00	73.00
Amboyna	...	57.00	55.00
Pepper, Black	990	29.00	27.30
White (Sarawak)	461	39.37½	38.25
Pearl Sago, Small	...	4.25	3.80
Medium	...	4.50	4.50
Large	...	5.50	5.50
Sago Flour, No. 1	3,780	3.02½	3.22½
No. 2	535	.90	.80
Flake Tapioca, Small	466	5.25	4.65
Medium	20	...	...
Pearl Tapioca, Small	590	4.90	4.60
Medium	551	5.30	4.80
Bullet	50	6.25	5.75
Tin	2,640	88.00	81.25

Export Telegram to Europe and America.

Fortnight ending 15th July, 1905.

Wired at 5 P.M. on 17th July, 1905.

				Tons.
Tin	Str.	Singapore and Penang to	United Kingdom &/or	1,168
Do.	,,	Do.	U. S. A.	430
Do.	,,	Do.	Continent	445
Gambier	,,	Singapore	Glasgow	..
Do.	,,	Do.	London	...
Do.	,,	Do.	Liverpool	225
Do.	,,	Do.	U. K. &/or Continent	...
Cube Gambier	,,	Do.	United Kingdom	60
Black Pepper	,,	Do.	Do.	5
Do.	,,	Penang	Do.	...
White Pepper	,,	Singapore	Do.	30
Do.	,,	Penang	Do.	10
Pearl Sago	,,	Singapore	Do.	35
Sago Flour	,,	Do.	London	...
Do.	,,	Do.	Liverpool	1,200
Do.	,,	Do.	Glasgow	100
Tapioca Flake	,,	Singapore & Penang	United Kingdom	240
T. Pearl & Bullets	,,	Do.	Do.	300
Tapioca Flour	,,	Penang	Do.	50
Gutta Percha	,,	Singapore	Do.	10
Buffalo Hides	,,	Do.	Do.	60
Pineapples	,,	Do.	Do.	cases 58,000
Gambier	,,	Do.	U. S. A.	500
Cube Gambier	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	220
Do.	,,	Penang	Do.	100
White Pepper	,,	Singapore	Do.	20
Do.	,,	Penang	Do.	...
T. Flake & Pearl	,,	Singapore & Penang	Do.	170
Nutmegs	,,	Do.	Do.	10
Sago Flour	,,	Singapore	Do.	250
Pineapples	,,	Singapore	Do.	cases 1,750
Do.	,,	Do.	Continent	,, 4,500
Gambier	,,	Do.	S. Continent	50
Do.	,,	Do.	N. Continent	490
Cube Gambier	,,	Do.	Continent	55
Black Pepper	,,	Do.	S. Continent	15
Do.	,,	Do.	N. Continent	160
Do.	,,	Penang	S. Continent	...
Do.	,,	Do.	N. Continent	...
White Pepper	,,	Singapore	S. Continent	...
Do.	,,	Do.	N. Continent	35
Do.	,,	Penang	S. Continent	...
Do.	,,	Do.	N. Continent	...
Copra	,,	Singapore & Penang	Marseilles	860
Do.	,,	Do.	Odessa	...
Do.	,,	Do.	Other South Continent	100
Do.	,,	Do.	N. Continent	2,200
Sago Flour	,,	Do.	Continent	750
Tapioca Flake	,,	Singapore & Penang	Do.	70
Do. Pearl	,,	Do.	Do.	310

				Tons.
Copra	Str.	Singapore	England	50
Gambier	,,	Do.	U. S. A.	...
Cube Gambier	,,	Do.	Do.	...
T. Flake and Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	...
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	...
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	...
Pineapples	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,	Do.	Do.	..
T. Flake & Pearl	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...

1,200 tons Gambier
480 ,, Black Pepper } Contracts.

Export Telegram to Europe and America.

Fortnight ending 31st July, 1905.

Wired at 2.45 P.M. on 2nd August, 1905.

				Tons.
Tin	Str.	Singapore & Penang to	United Kingdom &/or	1,050
Do.	,,	Do.	U. S. A.	690
Do.	,,	Do.	Continent	375
Gambier	,,	Singapore	Glasgow	...
Do.	,,	Do.	London	25
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	U. K. &/or Continent	225
Cube Gambier	,,	Do.	United Kingdom	25
Black Pepper	,,	Do.	Do.	10
Do.	,,	Penang	Do.	30
White Pepper	,,	Singapore	Do.	40
Do.	,,	Penang	Do.	...
Pearl Sago	,,	Singapore	Do.	15
Sago Flour	,,	Do.	London	420
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	Glasgow	125
Tapioca Flake	,,	Singapore & Penang	United Kingdom	200
T. Pearl & Bullets	,,	Do.	Do.	230
Tapioca Flour	,,	Penang	Do.	525
Gutta Percha	,,	Singapore	Do.	30
Buffalo Hides	,,	Do.	Do.	15
Pineapples	,,	Do.	Do. cases	6,500
Gambier	,,	Do.	U. S. A.	525
Cube Gambier	,,	Do.	Do.	10
Black Pepper	,,	Do.	Do.	290
Do.	,,	Penang	Do.	20
White Pepper	,,	Singapore	Do.	10
Do.	,	Penang	Do.	10
T. Flake & Pearl	,,	Singapore & Penang	Do.	65
Nutmegs	,,	Do.	Do.	19
Sago Flour	,,	Singapore	Do.	125

				Tons.
Pineapples	Str.	Singapore	U. S. A.	cases 1,750
Do.	,,	Do.	Continent	,, 2,750
Gambier	,,	Do.	S. Continent	85
Do.	,,	Do.	N. Continent	220
Cube Gambier	,,	Do.	Continent	70
Black Pepper	,,	Do.	S. Continent	210
Do.	,,	Do.	N. Continent	60
Do.	,,	Penang	S. Continent	20
Do.	,,	Do.	N. Continent	...
White Pepper	,,	Singapore	S. Continent	30
Do.	,,	Do.	N. Continent	95
Do.	,,	Penang	S. Continent	20
Do.	,,	Do.	N. Continent	10
Copra	,,	Singapore & Penang	Marseilles	150
Do.	,,	Do.	Odessa	840
Do.	,,	Do.	Other S. Continent	1,000
Do.	,,	Do.	N. Continent	150
Sago Flour	,,	Do.	Continent	650
Tapioca Flake	,,	Singapore & Penang	Do.	45
Do. Pearl	,,	Do.	Do.	170
Copra	,,	Singapore	England	...
Gambier	,,	Singapore	U. S. A.	...
Cube Gambier	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	...
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	...
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	...
Pineapples	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do	...

1,000 tons Gambier } Contracts.
180 ,, Black Pepper }

Singapore.

Abstract of Meteorological Readings for the month of July, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory … …	29·891	140·5	81·6	89·5	74·4	15·1	78·1	·885	75·8	78	S.S.E.	6·77	2·93

A. B. LEICESTER,
Meteorological Observer.

D. K. McDowell,
Principal Civil Medical Officer, S. S.

Kandang Kerbau Hospital Observatory,
Singapore, 14th August, 1905.

Penang.

Abstract of Meteorological Readings in the Prison Observatory for the month of July, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	°F	%		Ins.	Ins.
Criminal Prison Observatory	29·874	145·5	80·4	89·7	74·1	15·6	75·5	·788	70·75	71	S.	7·50	2·86

Colonial Surgeon's Office,
Penang, 8th August, 1905.

M. E. SCRIVEN,
Assistant Surgeon.

S. LUCY,
Acting Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for the month of July, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Durian Daun Hospital	29·795	154·0	82·2	88·6	74·7	13·9	79·9	1·000	71·4	90	S. W.	11·27	2·31

Colonial Surgeon's Office,
Malacca, 18th August, 1905.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of July, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping	...	152	82·98	93	70	23	77·36	864	...	77	...	9·02	2·70
Kuala Kangsar ...	...	...	80·79	93	70	23	76·13	840	...	80	...	5·64	1·80
Batu Gajah ...	...	155	81·16	92	70	22	76·81	866	...	81	...	4·00	1·37
Gopeng ...	...	...	81·15	93	61	32	76·13	834	...	78	...	4·76	1·21
Ipoh ...	...	...	80·37	92	70	22	75·94	840	...	80	...	4·45	1·12
Kampar ...	...	...	...	...	70	...	...	...	...	...	...	4·41	1·27
Teluk Anson ...	...		81·95	91	70	21	77·18	871	...	80	...	2·06	1·18
Tapah	...		81·37	90	69	21	76·41	843	...	78	...	5·78	2·24
Parit Buntar	...		83·30	94	65	29	77·52	868	...	76	...	1·52	·97
Bagan Serai	...	...	82·65	92	69	23	77·51	876	...	79	...	3·48	1·72
Selama	...	...	82·35	91	71	20	77·57	883	...	80	...	3·38	·68

State Surgeon's Office,
Taiping, 12th August, 1905.

M. J. WRIGHT,
State Surgeon.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of July, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·884	149·1	79·9	89·4	70·6	18·8	76·2	0·830	73·6	81	Calm.	6·03	1·08
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	3·17	0·67
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	7·04	0·97
,, Klang	...	...	...	88·4	70·9	17·5	...	...	...	...	...	8·09	2·28
,, Kuala Langat	...	...	...	88·3	74·0	14·3	...	...	...	...	...	4·73	1·15
,, Kajang	...	...	...	89·8	71·6	18·2	...	...	...	...	...	6·11	2·00
,, Kuala Selangor	...	...	...	...	...	...	...	...	...	...	...	6·78	1·88
,, Kuala Kubu	...	...	...	92·0	71·8	20·2	...	...	...	...	...	8·67	2·53
,, Serendah	...	...	...	90·9	74·7	16·2	...	...	...	...	...	11·10	2·22
,, Rawang	...	...	...	93·2	68·5	24·7	...	...	...	...	...	5·43	1·85
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	5·00	1·38
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	...	3·96	1·00

STATE SURGEON'S OFFICE,

Kuala Lumpur, 12th August, 1905.

E. A. O. TRAVERS,

State Surgeon, Selangor.

Muar.

Abstract of Meteorological Readings for the month of July, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Lanadron Estate ...	...	...	82°	89°	72°	17°	75°	...	...	...	...	10·85	1·88

Muar, 12th August, 1905.

ROGER PEARS.

The Duff Development Company, Limited, Kelantan.

Abstract of Meteorological Readings for the month of July, 1905.

District.	Temperature.			Rainfall.	
	Maximum.	Minimum.	Range.	Total Rainfall.	Greatest Rainfall during 24 hours.
	Mean. °F	Mean. °F	Mean. °F	Inches.	Inches.
Kuala Lebir ...	88·8	71·0	17·0	4·58	·89
Ulu Liang ...	88·4	70·4	18·0	7·06	1·29
Kuala Kelantan ...	86·5	73·4	13·1	5·32	1·90

Surgeon's Office,

13th August, 1905.

JOHN D. GIMLETTE,

Surgeon.

METEOROLOGICAL OBSERVATIONS.

Table Showing the Daily Results of the Reading of Meteorological Observations taken at the General Hospital, Seremban, for the Month of June, 1905.

Date.	Temperature of radiation.						Temperature of radiation.				Wind.		Temperature of evaporation.			Computed vapour tension.			Relative humidity.			Clouds 0 to 10.			Cloud and weather direction.			Rain
											Direction.																	
	9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Sun.	Difference sun and shade.	Grass.	Difference shade and radiation.	9 H	15 H	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	21 H	9 H	15 H	21 H	Inches.
	°	°	°	°	°	°	°	°	°	°			°	°	°	in.	in.	in.	°	°	°							
1	79	79	79	89	71	18	157	68	...	...	S.E.	S.E.	73·9	75·6	74·	0·839	0·888	0·863	85	90	87·5	0	10	5	B	R	C	.85
2	80	82	81	89	75	14	156	67	...	...	S.E.	S.E.	76·6	75·3	75·9	·916	·877	·896	90	80	85	3	5	5	C	R	C	.06
3	81	87	84	87	72	15	136	49	...	...	N.E.	S.E.	76·2	75·5	75·8	·897	·884	·890	85	69	77	0	5	2	B	C	B	
4	82	83	82·5	88	74	14	153	65	...	...	S.E.	E.	75·3	76·3	75·8	·877	·905	·891	80	80	80	0	3	3	B	C	C	
5	79	83	81	85	74	11	105	20	...	...	E.	S.E.	75·6	78·	76·8	·888	·956	·922	90	85	87·5	3	5	3	C	C	C	·22
6	78	86	82	88	72	16	155	67	...	...	E.	S.W.	74·6	74·	74·3	·857	·855	·856	89	68	78·5	0	0	0	B	C	B	
7	78	85	81·5	85	73	12	130	45	...	...	S.E.	S.E.	74·6	75·	74·8	·857	·873	·865	89	72	80·5	3	0	0	C	B	B	·18
8	80	83	81·5	87	72	15	154	67	...	...	S.E.	S.E.	75·	74·7	74·8	·867	·856	·861	85	76	80·5	0	0	0	B	B	B	·11
9	77	86	81·5	87	72	15	147	60	...	...	S.E.	S.E.	73·6	72·8	72·2	·829	·808	·818	89	64	76·5	3	0	0	C	B	B	
10	81	87	84	88	72	16	149	61	...	...	S.E.	S.E.	72·	75·5	73·7	·802	·884	·843	76	69	72·5	0	0	0	B	B	B	
11	76	78	77	88	72	16	154	66	...	...	S.E.	E.	72·6	74·6	73·6	·801	·857	·829	89	89	89	0	10	2	B	B	B	·23
12	77	80	78·5	88	72	16	153	65	...	...	S.E.	S.E.	71·9	75·	73·4	·783	.867	·825	84	85	84·5	0	0	2	B	R	B	
13	77	83	80	84	73	11	108	24	...	...	S.E.	S.E.	73·6	76·3	74·9	·829	·905	·867	89	80	84·5	3	5	0	C	B	B	·12
14	75	83	79	85	72	13	151	66	...	...	S.E.	S.W.	71·6	71·3	71·4	·774	·766	·870	89	68	78·5	3	0	0	C	C	B	
15	78	85	81·5	86	72	14	151	65	...	...	S.E.	S.	72·9	71·8	72·3	·810	·781	·845	84	64	74	0	0	0	B	B	B	
16	78	87	82·5	87	74	13	151	64	...	...	S.E.	S.E.	72·9	72·2	72·5	·810	·792	·801	84	61	72·5	0	0	0	B	B	B	
17	83	85	84	86	74	12	137	51	...	...	S.	S.W.	74·7	73·4	74·	·856	·826	·841	76	68	72	3	3	2	C	B	B	·45
18	79	85	82	86	72	14	139	53	...	...	E.	S.W.	75·6	75·	75·3	·888	·873	·880	90	72	81	3	3	2	C	C	B	
19	80	83	81·5	86	73	13	148	62	...	...	S.E.	S.E.	73·3	74·7	74·	·820	·856	·838	80	76	78	3	0	0	C	C	B	
20	81	82	81·5	85	73	12	149	64	...	...	S.E,	S.E.	76·2	75·3	75·7	·897	·877	·887	85	80	82·5	3	5	5	C	B	C	1·11
21	83	86	84·5	87	75	12	147	60	...	...	S.E.	E.	73·	72·8	72·9	·810	·808	·809	72	64	68	2	10	3	B	C	C	·10
22	79	85	82	86	73	13	150	64	...	...	E.	E.	73·9	75·	74·4	·839	·873	·856	85	72	78·5	0	3	10	B	R	R	2·35
23	81	85	83	87	71	16	152	65	...	...	N.E.	S.E.	76·2	75·	75·6	·897	·873	·885	85	72	78·5	0	3	2	B	C	B	
24	80	86	83	87	75	12	154	67	...	...	S.E.	S.	73·3	72·8	73·	820	·808	·814	80	64	72	2	3	2	B	C	B	
25	79	88	83·5	88	72	16	149	61	...	...	S.E.	S.	73·9	70·	71·9	·839	·733	·786	85	55	70	0	0	2	B	C	B	
26	81	87	84	87	72	15	149	62	...	...	S.E.	S.	72·	72·2	72·1	·802	·792	·797	76	61	68·5	0	0	0	B	B	B	
27	80	87	83·5	88	71	17	154	66	...	...	S.E.	S.E.	71·6	72·2	71·9	·775	·792	·783	75	61	68	0	0	0	B	B	B	
28	83	83	83	86	74	12	142	56	...	...	S.E.	S.W.	73·	74·7	73·8	·810	·856	·833	72	76	74	0	0	0	B	B	B	
29	80	87	83·5	88	73	15	150	62	...	...	E.	S.	73·3	73·9	73·6	.820	.837	.828	80	65	72·5	0	0	3	B	B	C	
30	85	83	84	87	74	13	148	61	...	...	S.E.	S.	75·	73·	74·	·873	810	·841	72	72	72	3	3	0	C	C	B	

Total 5·78

R. VAN GEYZEL,
Apothecary.

STATE SURGEON'S OFFICE,
Seremban, 12th July, 1905.

No. 9.] SEPTEMBER, 1905. [VOL. IV.

AGRICULTURAL BULLETIN
OF THE
STRAITS
AND
FEDERATED MALAY STATES.

EDITED BY
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Director of Botanic Gardens, S. S.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling ttention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples ubmitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has ‘been established to acquire information by special enquiries and ‘by experimental research, technical trials and commercial valua‘tion regarding new or little known natural or manufactured pro‘ducts of the various Colonies and Dependencies of the British ‘Empire and of Foreign Countries, and also regarding known ‘products procurable from new sources, and local products of ‘manufacture which it is desired to export. This work is carried ‘out with a view to the creation of new openings in trade, or the ‘promotion of industrial developments."

2. In an extensive and well equipped series of Research Labor- tories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the nvestigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and esins, fibres, timbers, medicinal plants and products, with a view o their commercial utilization. Whenever necessary these mate- ials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard o the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy ources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations re supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meet- ng, a statement of such outlays will be furnished, for repayment,

3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.

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THE AGRICULTURAL EXHIBITION HELD IN PENANG.

The second Agricultural Exhibition for the whole of the Malay Peninsula which was held at Penang this year was undoubtedly the finest display of the produce of the country both in agricultural products and in artistic work ever exhibited to the public in the Peninsula. Some Ceylon visitors were heard to ask why cannot we have Shows like this in Ceylon? Nothing approaching such an exhibition having ever been seen in the neighbouring Colony. The display indeed reflected the greatest credit on the Secretary, Committees and the numerous exhibitors and others who contributed to the success of the Show. The weather was perfect, hardly any rain falling during the three days of the Show, and the crowds of Europeans and Natives who came to see the exhibits testified to the interest taken in the produce of the country. Indeed, Penang was so crowded with visitors that many found some difficulty in finding places to stay in the town.

It was noticed that the Native exhibitors were this year more apt at the work of exhibiting their produce than on previous occasions, and seemed to understand the methods and regulations adopted for the arrangements of the different classes better than last year, thus relieving the Secretaries and others of a good deal of work.

In the Art Section which was very large, the Natives had no cause for regret that they had brought their works to Penang, for those who did not get prizes were gratified by the way in which the public bought their exhibits, and more would doubtless have been sold had not the unsold stock been repacked and carried off by the exhibitors on the last day with surprising rapidity. It would, perhaps, be worth considering if on future occasions some arrangement could be come to to have a sale-day after the Show.

The exhibition was opened at eleven o'clock on the first day by His Excellency Sir JOHN ANDERSON who had previously made a tour of the buildings. After a speech by Mr. J. K. BIRCH, His Excellency spoke for a considerable time on the subject of the exhibition and on the progress of agriculture; his remarks being very much to the point and very well received, after which he declared the Show open. The exhibition remained open till Friday evening when the Cups which had been presented by various donors were distributed to the winners by Mr. BIRCH.

AGRICULTURAL PRODUCE.

The section for agricultural produce was the biggest and perhaps the most interesting part of the Show and both in quantity and quality exceeded all previous exhibitions. Taking the classes as they were arranged in the schedule, arrowroot was well shown, Mr. W. W. NORRIS of Singapore taking first prize and diploma for roots as he did last year and a second prize for prepared arrowroot. The second prize for roots fell to Caledonia Estate, the third to Penghulu MAT CHIE. Prepared arrowroot was represented by a number of good samples, the first prize being allotted to Mr. CHOW AH NEAN, his sample being a little finer than that of Mr. NORRIS. In this class, a sample of the roots of *Canna edulis*, *Tous les mois*, a form of arrowroot seldom cultivated, was shewn.

Betel-nuts both fresh in the husk and dried and split were extensively exhibited, over fifty samples of the latter class being entered. The prize for fresh Betel-nuts fell to Mr. C. J. WILLIAMS with a very fine bunch. Dried nuts were more difficult to judge owing to the great number shown and the excellence of the samples. The comparative values of this product are estimated not only by the size of the nut and its fully ripe condition but also by its fullness and absence of a crack or split in the centre.

There were but few entries for articles made from the Coco-nut palm, and those not very first class collections but many of such articles were to be found in the Art Section of the Show. Coco-nut oil was clearly a popular exhibit, over eighty bottles of good, bad and indifferent oil being staged.

Toddy was represented by five or six exhibits, that of Caledonia Estate being considered by the expert employed to judge, a Tamil man, as very superior.

The great Show thus of products of the Coco-nut palm illustrated the great importance of this plant to the Malay Peninsula and the excellence of the produce in all its forms.

Dragon's blood, the red resin from the shells of the fruit of *Dæmonorops* was represented by several high class specimens. ABDUL WAHAB taking the first prize with a good bright coloured sample of powder, and block with a bunch of the fruit.

Of Indigo there were several samples chiefly liquid and paste, Caledonia Estate showed a bottle of Indigo powder, dry, rather pale in colour, but considered worthy of special commendation by the judges on account of the difficulty and importance of preparing it in this form.

Fibres were poorly shewn, compared with the fine lot shewn last year by Mr. SCHIRMER, who did not exhibit on this occasion. Chiefly noticeable was some excellent rope of *Sanseviera* fibre prepared by Mr. PRIOR. There is a future for fibre in the Malay Peninsula and we shall hope to see it better shewn at future Shows.

Some samples of Raphia bast prepared in the Botanic Gardens, Singapore, from the leaves of the *Raphia ruffia* palm were shewn in this section.

Cocoa pods were only represented by two lots, neither ripe and of very inferior quality and no prize was awarded.

Cloves had thirteen exhibits and were fairly good. The sample that obtained the first prize being excellent, but we remember to have seen a better Show of this spice in former exhibits in Penang.

Nutmegs were very good and a considerable number both in the husk and in the shell were shewn, and Mace was also well represented.

There were several entries for collections of spices used in curries, very nicely got up and arranged.

Ginger was not as finely shewn as we have seen, though the sample which obtained the first prize shewn by Mr. CHIN KIN GOON was by no means a bad one. The other samples were small and rather poor. The same might be said of Turmeric, the first sample, however, shewn by Mr. KANG THEAN SUNG, was exceptionally good. Perhaps the dry season at the beginning of the year may have been the cause of the poorness of the exhibits in these classes.

Pepper, both white and black, was represented by excellent examples from Gapis and Kamuning Estates and also from Sepang. In this class some excellent pepper was staged which was disqualified by the judges as it was discovered that the exhibitor was a dealer in Penang who had imported his samples from Achin.

There were one or two other cases in agricultural produce in which the exhibitor had shewn products purchased by him in the market, and unfortunately, by some oversight, the regulations did not prevent an exhibitor purchasing samples in the market and showing them as his own so long as they were grown in the Peninsula. Such a thing is hardly likely to occur except when the exhibitions are held in the large towns, Singapore and Penang, but the rules in this respect will require alteration.

Of Copra, over a hundred samples were shown, chiefly sundried, but Kiln-dried Copra was not wanting; many of the specimens were very fine.

The classes for Coco-nuts husked and unhusked, and collections of different kinds were, as at last year's Show, represented by a vast array, occupying one side of the building allotted to agricultural produce, and gave no small work to the judges to decide on which were the best. A Ceylon visitor was heard to remark that if he had known that the Malay Peninsula could produce such nuts he would have started planting here years ago. Mr. PRIOR as usual carried off the best prizes in this section both for collection and sample. In the collections of Coco-nuts some very odd varieties appeared, such as the horned Coco-nut with its short horn-like additional carpels, and some very narrow and small fruits, and many more useful varieties.

Coco-nut Sugar was well shewn, the samples being numerous and good, and giving some trouble to the judges to decide on their respective merits. There were five or six exhibits of Nipah Sugar, and plenty of the sugar from the Kabong palm *Arenga*, most of which was very good and some very excellent. Tea was not unrepresented ; Durian Tunggal estate taking first prize.

Gambir was fairly shewn, Penghulu KASAN'S Cube, and Nail gambir being a good sample.

Coffee shewed by the scantiness of the exhibits how much this product has fallen before the advance of rubber, still what was shewn was of very good quality. Mr. BAILEY carried off a prize for his hybrid *Stenophylla-liberica*, and was seconded by Mr. PRIOR, and the latter won on Liberian coffee both new and old.

Of Essential Oils there were a number of interesting kinds shewn. Mr. HARDOUIN staged a very pretty series of Patchouli, Nutmeg, Clove, Lemon-grass and Citronella. Mr. MACHADO shewed also several good and unusual oils including Calamus Oil, (*Acorus Calamus*) and Lemon Oil.

Citronella Oil was shewn also separately but not in large series.

Castor Oil had eight exhibits and was good. Sesamum Oil was also shewn, and one sample of Rubber Seed Oil very clear and bright was exhibited by Mr. COATES. Para rubber seed is too much in demand this year for planting to produce a large display of its value as an oil.

Sago Flour and Pearl Sago were not as well shewn as might have been expected, the samples being few and poor.

Tapioca roots were fairly good and some were large, and the display on the whole was about as good as usual.

Tapioca Flour and Pearl, and Flake Tapioca were well shewn and of good quality and colour.

Sugar Canes were not very extensively shewn, but it is unnecessary to say that those coming from Caledonia Estate were very fine. The variety of kinds shewn by other exhibitors was not large, but both crushing and eating canes were represented. A branched cane, not by the way a great rarity, attracted some attention. In refined Sugar, Caledonia Estate was the only exhibitor, for a very nice looking sample refined in Hongkong was promptly disqualified by the judges. Rum and Rum shrub also were only represented by samples from the great Sugar Estate, whence also came a sample bag of Molascuit, a new food for horses mostly composed of sugar, and said to be very popular with these animals.

Brown Sugar was well shewn, LEONG LAK HING of Bagan Serai getting a prize for this.

The Shows of Jungle Produce as represented by Guttas and Rubbers, and also Damars, were poor, and call for no special remarks. Rattans were well represented, a considerable number of collections being shewn. Many of those exhibited were, however, hardly trade rattans, still as collections they were good and interesting. Bamboos were well shown, ordinary kinds as well as the curious spotted bamboo, twisted ones, and some large specimens of the big *Dendrocalamus giganteus*.

Native herbs used in medicine were very much more extensively shewn than at last year's Show where there were but few entries. One competitor took a prize with a hundred and four different herbs with a catalogue of their native names and uses.

Mr. MACHADO brought from Kamuning estate some valuable drugs he had grown and prepared including Ipecacuanha, Jeringu (*Acorus calamus*) *Brucea sumatrana*. *Hydrocotyle asiatica*, dried leaves, and Papain for the latter he received a special prize.

Fodder grasses were represented by several collections, but none were particularly well selected. The exhibitors seemed to think that any grasses or sedges could be classed as fodder grasses, and some of the collections contained coarse sedges quite unsuited for fodder. Of Tuba roots a considerable number of samples were shewn, chiefly differing in thickness of root and neatness of preparation.

Patchouli was well shewn, twenty-two samples being staged, Mr. MACHADO again this year carried off first prize with fine and well dried leaves. Of Sirih leaves there were twenty-six specimens, both of the Chinese and Malay strains, nearly all were very fine large-leaved samples. The Malay who was asked to judge this difficult class, gave his verdict for the red veined form.

Indian corn was good and abundant, some fine coles being shown. There was little variety in the kinds staged, only one sample of the red corn being shown.

Cotton was chiefly and largely represented by the short stapled Javanese cotton, but Mr. LOGAN won on a fine sample of Egyptian prepared with great care, and grown in the North of Province Wellesley, Mr. MACHADO also showed Egyptian.

Kapok was very abundant, and many of the samples very good. Para rubber was naturally one of the most interesting and attractive exhibits and the collection was for the most part superb. Mr. BAILEY'S crepe and fancy rubber were highly admired. Mr. PRIOR'S crepe, and the samples shown by Mr. COATES, Mr. MACHADO and Sandy Croft estate were all of the finest qualities. The old fashioned biscuits were represented but the crepe and flat oblong sheets were more in favour, and the round biscuits seem to be almost a thing of the past. Scrap was well prepared by Mr. BAILEY and Mr. MEIKLE, and was really very good. Rambong was not wanting, Mr. PRIOR'S crepe strips being the best sample of this rubber we have seen, Mr. BAILEY shewed excellent samples. One untoward thing occurred in the judging of the rubber classes, Mr. LAKE and PAGETS' cup for any rubber of other class than what took first prize in Para rubber, was awarded to a good sample of sheet rubber, entered in the name of a Chinaman, who it proved later was merely a buyer and not a cultivator. In cases like this the prize should really belong to the grower and preparer of the rubber and not the mere agent, who has no claim to it.

A prize offered for improved rubber machinery was awarded to an improved roller for making sheet rubber. It is needless to say that both in quantity and quality the exhibition of rubber was an immense improvement on the display of last year's Show, and was an exhibition of which the planters might well be proud.

FLOWERS AND PLANTS.

The exhibition of horticulture was by no means what it has been at previous Shows, and was little if at all better than that of last year's Show at Kwala Lumpur, a very large number of the classes in the schedule were not at all represented. The flowers were scanty and on the whole poor, the foliage plants not up to standard, why this should be one cannot say, but one cannot help feeling that we have not now-a-days the horticulturists of some years back. In a country where so many fine and beautiful plants can be easily grown, it is regrettable to see so poor a Show staged.

A fine *Grammatophyllum speciosum* with eight flower spikes shewn by Mr. A. OECHALE was very attractive. The Cantonese Club showed a fine series of cock's combs and of asters, but beside this there was practically nothing in the way of flowering plants to look at. The Botanic Gardens of Penang shewed some fine Cattleyas and other orchids, and the beautiful white, red and pink Tobaccos, *Nicotiana Sanderiana* and *affinis* and a number of pinks which brightened up the exhibition considerably of foliage-plants. Mr. JOHN BROWN shewed a good group of aroids and Mr. MACHADO brought from Kamuning a very fine pot of white Caladium ; Mrs. LOGAN took a prize with a large Asparagus plant. Palms were somewhat better shewn, KOW JO TOK took the first prize for six palms, well grown but common kinds, Mr. MACHADO showed some of the rarer nature palms from the Kamuning woods, including both forms of new Pinanga acaulis and Iguanuara Wallichii, and took the first prize for specimen palm with a well grown *Licuala grandis*.

Mr. TAN TIN BEE shewed a nice little lot of palms also including the gem of the whole of the foliage plants, a perfect specimen of the beautiful and rare *Licuala orbicularis* from Borneo.

Two lots of the Chinese grotesque plants were shown, both good of their kind.

Mrs. J. BROWN shewed a fairly good group of various plants.

A few medium Crotons, a poor lot of Begonias, some mediocre ferns and Selaginiellas made up the rest of this part of the exhibition. The cut and arranged flowers were scanty, the roses were fairly good, those of Kamuning being very good for low country cultivation. There were several entries for table decoration, Mrs. Fox securing the first prize for a pretty arrangement of roses, a table decorated with pink and white Honolulu creeper was the next best arrangement.

VEGETABLES.

In the classes for vegetables there were some fa rly good exhibits but the attraction in this part of the Show was the superb series of vegetables from the Perak Hills Gardens shown by Mr. CAMPBELL. Here on a circular table were shown peas, carrots of two varieties, very large, excellent cabbages, potatoes of unusual size for even our hill stations, excellent beet root, tomatos, leeks, radishes, vegetable marrows, two varieties, turnips, kohlrabi, celery (exceptionally large) artichokes, chocho, parsley, mint and several other vegetables. Undoubtedly the finest exhibition of European vegetables ever seen in the Peninsula.

With these were staged some good Cocoa-pods, and some thin sheets of Ceara rubber (very clean and good) Castilloa, Rambong, and Para rubber. The whole display reflected the greatest credit on Mr. CAMPBELL. Of the vegetables shown for competition the first prize for collection of vegetables was won by a very poor lot, Cucumbers were fairly good, and so were beans of different kinds, the rest of the vegetables were very ordinary.

FRUIT.

The fruit classes were better on the whole and contained some very good exhibits, but it was difficult to see on what grounds the judges awarded their decisions, as in the cases of durians, pineapples, papayas and pumeloes, the fruits were not even opened, so that flavour and condition seemed to be eliminated in deciding the comparative value of the fruits. In the case of any fruit not specially classed a prize was given to some fruits supposed to be lemons, and by some thought to be oranges, but which were really one of the citrons of inferior quality. The most noticeable fruits in this class were some good avocado pears shown by Mr. COATES, and some good pomegranates shewn by Mr. KHEW KHOOI of Balik Pulau, but neither of these exhibits obtained any mark of commendation.

But few Rambutans were shown, although the crop seemed to be very fine in Penang this year, but the samples were fairly good, and the Pulasans better, Tampunet, (*Artocarpus rigida*) a fruit less well known to the Eurpoean than it should be was well shown. A good number of pines were shown, chiefly Mauritius pines, of which the sample which received the first prize was hardly in condition. There were two samples of black West Indian, one of which large but overripe obtained a first prize, the second in better condition, were smaller. A second prize was won by some field pines, (of the Red Ripley style) large but of no particular merit. A special prize was awarded to a tall-stemmed pine with a small and almost rotten fruit. Perhaps the most interesting pine shewn was the Pernambuco (*Abacaxi*) of which three fruits hardly ripe, however, were shown by Mr. COATES. This white fleshed pine is perhaps the finest eating pine in the world.

Of other fruits especially noticeable were some very fine Binjai of great size, which well deserved the prize they obtained. The Guavas were also good and there were ten exhibits of Dukus.

Bachangs, Champedaks, Watermelons (as far as one could judge from unopened fruits) were all good, and the Chikus (Sapodillas) were of good size but not ripe. The Pumeloes were good in point of size. The Durians it was impossible to form an opinion on as none were opened. Oranges were only represented by two exhibits, one sent by Mr. KIM KEAT of Singapore was deservedly given a first prize. Mangosteens considering the poor season were well up to standard. Of Papayas hardly any but the very large green kind were shown. These though highly suitable for extracting papain, are usually very inferior as fruit to the smaller orange variety, which was only represented by one or two fruits. Bananas were plentiful but most were overripe, some of the bunches however were in good condition and of good strains. The prize for the collection of fruit was won by Mr. LOGAN with a good and well arranged set in excellent condition. On the whole, considering that the fruit season has been a bad one this year in most places, the display of fruit was good, and very superior so the show of vegetables.

ART.

The Art Section of the Show was even better than that of last year and was indeed overcrowded. Among the exhibits which had a botanical interest were some hats of the style of Panama hats made by the Sakais under the direction of Mr. CERRUTI. These hats which were soft and flexible and of good form and texture were made of strips of Banana fibre. Mr. CERRUTI at first attempted to cultivate the Panama hat-plant (*Carludovica palmata*) for this purpose and plants were sent from the Singapore Botanic Gardens, but this plant is of slow growth, at least in this country, and so he taught the Sakais to use the cultivated Banana instead. Only some half dozen hats were exhibited, but they were so highly appreciated by the public that any number could probably be disposed of. Mr. CERRUTI may be congratulated on his inducting the Sakais into manufactures of useful articles for which there is some demand.

STOCK.

The exhibition of stock was by no means as good as might have been expected, or indeed as was shewn at the Show held at Penang some years ago.

Cattle were hardly shown at all. Mr. DOUGLAS won a prize however with a small but nice looking Australian bull, as champion animal in the Cattle section. Local bred and Indian Cattle were poorly represented. Buffalos were represented by a couple of bulls of no great merit.

Pigs were better shown, there were some very good sows on view. The champion animal being an enormous and very sulky brute, weighing 480 catties ($5\frac{1}{2}$ cwt). There were a good number of litters of pigs also. Goats were few and not very good. Sheep had all classes filled, the first prize Ewe sheep being exceptionally fine, the other exhibits were fair.

POULTRY.

The exhibition of poultry was very good, and far in advance of last year's Show. Mr. H. WOOL won the prize for the champion with a grand pair of fowl. Two pens of Buff Cochins were highly admired and there was a good show of Bantams, Malay fowl, Silkies, and other breeds. Guinea fowl were not as good as last year, only one entry of a pair of good white birds being made. Muscovy ducks and Manila ducks were well shown, and the Geese were fine and in good condition.

The Pigeons, Antwerps and Fantails were very good, but there aught to have been more entries.

Of Cage-birds a number of different kinds were shown, Nicobar Pigeons, Pergam (*Carpophaga*), Hornbill, Parakeets, Crested Partridges, Avadabats and other birds.

Rabbits, at one time a feature of Penang Shows, were not exhibited. Two lots of Guinea Pigs however created much interest among the Natives.

PRODUCE.

The Butter which was rather extensively shown was very good, and there were many entries for Eggs, both of fowls and ducks, and some of the samples were exceptionally good.

THE GOVERNOR'S CUP.

For the best general exhibit in Agricultural produce was carried off by Caledonia Estate, Kamuning coming second. This cup was judged for by a system of marks for first, second and third prizes, and for exhibits which did not take prizes but were worthy of being shown, Mr. MACHADO of Kamuning Estate won a cup given for the best general exhibit of the Show, shewing Para Rubber, Coconuts, Ginger, Oils, Papain and other drugs, Pepper black and white, Patchouli, Arrowroot, Betelnuts, Kapok, Coffee, Fibre, Citronella Oil, Coconut Oil, Sirih, Tapioca roots, Tea, Tuba, Turmeric, Chilis, Limes, Roses, Palms, Fowls, two breeds, Eggs, Caladiums, not a bad exhibition for a comparatively small estate. Caledonia estate showed Betelnuts, Arrowroot, Indigo, Rum, Rum shrub, Sugarcane, Sugar, Patchouli, Cotton, Kapok, Coffee, Oil, Coconuts, Tapioca, Toddy and Rubber. Mr. PRIOR though showing less in variety did very well with his fine lot of produce, taking three prizes for Coconuts, one for Copra, two for Coffee, two for Rubber and a highly commended Fibre, which was about all he showed.

NEXT YEAR'S EXHIBITION.

At the suggestion of His Excellency the Governor the exhibition in 1906 will be held at Singapore about the end of July or beginning of August, and we shall hope to have as successful an exhibition as the last.

PRIZES AWARDED AT THE PENANG AGRICULTURAL SHOW 1905.

DIVISION *A*.

Agricultural Produce.

Class.		1st. $	2nd. $	3rd $	Extra. $
1.	*Arrow-root, fresh, best sample.*				
	Harry H. Norris, Singapore	5	0	0	0
	Caledonia Estate, Province Wellesley	0	2	0	0
	Penghulu Mohamed Sahid, Nibong Tebal	0	0	1	0
2.	*Arrow-root, prepared, best sample.*				
	Chow Ah Nyen, Penang	5	0	0	0
	Harry H. Norris, Singapore	0	2	0	0
	Sahid bin Lebai Mohamed Salleh, Nibong Tebal	0	0	1	0
3.	*Bamboos, best collection.*				
	Penghulu of Pulau Tiga, Lower Perak	5	0	0	0
	Penghulu Pulau Kemeri, Kuala Kangsa	0	2	0	0
	Sahat bin Rahman, Malacca	0	0	1	0
4.	*Betel-nuts, fresh.*				
	C. J. Williams, Bukit Mertajam	3	0	0	0
	Penghulu Mamud, Negri Sembilan	0	2	0	0
	Gan Pow, Butterworth	0	0	1	0
5.	*Betel-nuts, dried and split.*				
	Mohamed Hassin, Bukit Mertajam	5	0	0	0
	Kung Thean Sung, Penang	0	3	0	0
	Penghulu Mamud, Malacca	0	0	1	0
6.	*Cloves, best sample.*				
	Law Chit Mun, Penang	10	0	0	0
	S. M. Peralta, Malacca	0	5	0	0
	Cheah Soon Soon, Penang	0	0	2	0
7.	*Coconuts, unhusked, best sample.*				
	Penghulu Mat Hassan, Bukit Mertajam	7	0	0	0
	H. Alam, Malacca	0	3	0	0
	Bertam Estate	0	0	1	0
8.	*Coconuts, husked, best sample.*				
	Pachee, Province Wellesley	7	0	0	0
	Penghulu Lehir, Telok Anson	0	3	0	0
	Penghulu Mat Assan, Bukit Mertajam	0	0	1	0
	Penghulu Yusop, Malacca (Extra Prize)	0	0	0	3
9.	*Coconuts, best collection of varieties.*				
	E. B. Prior, Selangor, Medal	10	0	0	0
	Abu Kassim, Krian	0	5	0	0
	Syed Hamad, Penang	0	0	2	0
	C. J. Williams, Bukit Mertajam (Extra Prize)	0	0	0	5
10.	*Copra, best sample sun dried.*				
	E. B. Prior, Selangor	5	0	0	0
	Penghulu of Bagan Datoh, Lower Perak	0	3	0	0
	Gan Pow, Butterworth	0	0	1	0
	Carried over $	62	30	12	8

DIVISION *A.—Continued.*

Class.		1st.	2nd.	3rd.	Extra.
		$	$	$	$
	Brought forward	62	30	12	8
11.	*Copra, best sample kiln dried.*				
	Gan Pow, Butterworth	5	0	0	0
	Koe Tiang Hock, Penang	0	3	0	0
12.	*Coconut palm, best collection of products.*				
	Osman, Penang	10	0	0	0
	Megat Yassin, Kuala Kangsa	0	5	0	0
	Ngah Ma Aruf, Kuala Kangsa ...	0	0	2	0
13.	*Cotton, "Kabu Kabu" best sample.*				
	Haji Mohamed Sahaat, Penang ...	5	0	0	0
	Syed Ahmad, Penang	0	3	0	0
	Mohamed Hassin, Bukit Mertajam ...	0	0	1	0
14.	*Cotton "Kapas" any other variety best sample.*				
	D. Logan, Penang, Medal	10	0	0	0
	A. D. Machado	0	5	0	0
	Che Brahim, Province Wellesley ...	0	0	2	0
16.	*Coffee, Liberian.*				
	E. B. Prior, (Selangor) Medal	10	0	0	0
	W. W. Bailey, (Selangor)	0	5	0	0
	C. & R. S. Meikle, Wardieburn Estate ...	0	0	2	0
17.	*Coffee, any other variety.*				
	W. W. Bailey, (Selangor)	5	0	0	0
	E. B. Prior, Selangor	0	3	0	0
18.	*Dragon's Blood, best sample.*				
	Abdul Wahab, Krian	5	0	0	0
	Penghulu Hassin, Krian	0	3	0	0
	P. Cornelius, Penang	0	0	1	0
19.	*Fibres, best collection.*				
	Syed Ahmed, Penang	15	0	0	0
	Mydin, Penang	0	7	0	0
	Shaik Hossain, Penang	0	0	2	0
20.	*Fodder, Grass best collection.*				
	Alli, Penang	5	0	0	0
	Mohamed Arasat, Penang	0	3	0	0
	Chek Lah, Penang	0	0	1	0
21.	*Gambier, best sample.*				
	Penghulu Kassan, Ayer Molek, Malacca ...	5	0	0	0
	Penghulu Haji Jawal, Ayer Molek, Malacca	0	3	0	0
	Penghulu Haji Mamud, Ayer Molek, Malacca	0	0	1	0
22.	*Getahs, best collection of local.*				
	Penghulu Grik, Perak	7	0	0	0
23.	*Gums and Dammars, best collection of local.*				
	Haji Saman bin Itam, Malacca ...	7	0	0	0
	Penghulu of Pulau Tiga, Lower Perak ...	0	3	0	0
	Penghulu Grik, Perak	0	0	1	0
24.	*Ginger, best sample.*				
	Chin Kim Yoon, Penang	5	0	0	0
	Carried over	$156	73	25	8

DIVISION *A.—Continued.*

		1st.	2nd.	3rd.	Extra.
		$	$	$	$
	Brought forward	156	73	25	8
	Ginger, best sample—continued.				
	Kim Kwee, Penang	0	3	0	0
	A. D. Machado	0	0	1	0
25.	*Indigo, prepared, best sample.*				
	Teoh Heng Keat, Penang	5	0	0	0
	Tan Lo Heng, Krian	0	3	0	0
	C. J. Williams, Bukit Mertajam ...	0	0	1	0
	Caledonia Estate, P. W. (Special Prize) ...	0	0	0	5
27.	*Mace dried, red.*				
	Koey Lean Seang, Penang	5	0	0	0
	Chong Kim On, Penang	0	3	0	0
	Loh Hup Seang, Penang	0	0	1	0
28.	*Maize.*				
	Belal Mohamed Daud, Kuala Kangsa ...	5	0	0	0
	Anjang Dris, Kuala Kangsa	0	3	0	0
	Penghulu of Bandar, Lower Perak ...	0	0	1	0
29.	*Medicinal Plants, best collection.*				
	Penghulu of Durian Sebatang, Lower Perak	10	0	0	0
	Choo Ah Nyen, Penang	0	5	0	0
	Megat Yasin, Kuala Kangsa	0	0	2	0
30.	*Nutmegs, fresh, best sample.*				
	Kim Kee, Penang	5	0	0	0
	C. & R. S. Meikle, Wardiebum Estate, Selangor	0	3	0	0
	Kulub Abdul Karim, Kuala Kangsa ...	0	0	1	0
31.	*Nutmegs, dried, best sample.*				
	Chong Kim On, Penang	10	0	0	0
	Chong Ah Lim, Penang	0	5	0	0
	Teoh Tiang Siew, Penang	0	0	2	0
32.	*Oil, citronella, best sample.*				
	Mohamed Zain, Penang	10	0	0	0
	E. E. Chasseriau	0	5	0	0
	Mohamed bin Mat Salleh, Nibong Tebal ...	0	0	2	0
33.	*Oil, Coconut, best sample.*				
	Lim Soo Lim, Penang	10	0	0	0
	William Kellie Smith, Batu Gajah ...	0	5	0	0
	G. B. Baptist, Penang	0	0	2	0
34.	*Oil, teel seed (Minyak lengah) best sample.*				
	William Kellie Smith, Batu Gajah ...	5	0	0	0
	Syed Mohamed Idid, Penang	0	3	0	0
	Chain bin Che Mat, Penang	0	0	1	0
35.	*Oil, Castor, best sample.*				
	Sonna Router, Penang	7	0	0	0
	C. J. Williams, Bukit Mertajam ...	0	5	0	0
	Allex Smith, Kellas Estate, Batu Gajah ...	0	0	1	0
36.	*Oil, Para Rubber, best sample.*				
	W. J. Coates, Negri Sembilan ...	5	0	0	0
	Carried over	$233	116	40	13

DIVISION *A.—Continued.*

		1st.	2nd.	3rd.	Extra.
		$	$	$	$
	Brought forward	233	116	40	13
38.	*Oil cake, best sample.*				
	D. Mohamed Noor, Penang	5	0	0	0
39.	*Oils, best collection of essential.*				
	A. C. Hardouin, Bukit Tambun	10	0	0	0
	A. D. Machado	0	5	0	0
	William Kellie Smith, Kellas Estate, Batu Gajah	0	0	2	0
40.	*Pepper, white, best sample.*				
	E. R. Salisbury, Padang Rengas	10	0	0	0
	Lee Seng Nam, Selangor	0	5	0	0
	A. D. Machado	0	0	2	0
41.	*Pepper, black, best sample.*				
	E. R. Salisbury, Padang Rengas	10	0	0	0
	A. D. Machado	0	5	0	0
	Loh Kong Yew, Negri Sembilan	0	0	2	0
42.	*Pepper, Trang, best sample.*				
	Ban Tek Hong, Penang	10	0	0	0
43.	*Patchouli, best sample.*				
	A. D. Machado	5	0	0	0
	Mad Tahir, Kuala Kangsa	0	3	0	0
	Haji Gabor, Kuala Kangsa	0	0	1	0
44.	*Padi, any variety.*				
	Penghulu Che Puteh, Krian	10	0	0	0
	Penghulu Mohamed, Krian	0	5	0	0
	Haji Othman, Butterworth	0	0	2	0
45.	*Padi, best collection of varieties.*				
	Penghulu Haji Mohamed Ahib, Krian	50	0	0	0
	Osman bin Isahak, Nibong Tebal	0	25	0	0
	Haji Mamudin, Perak	0	0	10	0
46.	*Pulot, best sample.*				
	Penghulu Cheh Puteh, Krian	5	0	0	0
	Penghulu Sulong bin Husin, Malacca	0	3	0	0
	Kung Thean Sung	0	0	1	0
47.	*Pulot, best collection of varieties.*				
	Penghulu Che Puteh, Krian	7	0	0	0
	Osman bin Isahak, Nibong Tebal	0	3	0	0
	Mukim Ijok, Perak	0	0	1	0
48.	*Rice, prepared by machinery, best sample.*				
	Daub, Malacca	0	5	0	0
49.	*Rice, prepared by pounding, best sample.*				
	Penghulu Grik, Perak	10	0	0	0
	Haji Abas, Bukit Mertajam	0	5	0	0
	Penghulu Hasim, Krian	0	0	3	0
50.	*Rice, best collection of varieties.*				
	Haji Mamudin, Perak	0	5	0	0
	Muntri Tengah, Malacca	0	0	3	0
52.	*Rotans, best collection.*				
	Mat Asat	5	0	0	0
	Haji Mohamed Sahat, Penang	0	3	0	0
	Penghulu Grik, Perak	0	0	1	0
	Barried over	370	188	68	13

DIVISION *A.—Continued.*

		1st.	2nd.	3rd.	Extra.
		$	$	$	$
	Brought forward	370	188	68	13
53.	*Rubber, (rambong) best sample.*				
	W. W. Bailey, Selangor	0	10	0	0
54.	*Rubber, (Para & Rambong)* general exhibit which must be packed in boxes as sent from the Estate, and guaranteed that such exhibits have received no special treatment.				
	C. E. Symonds, Yam Seng Estate ...	0	10	0	0
55.	*Rubber, (Para) free from chemicals.*				
	W. J. Coates, Negri Sembilan	0	10	0	0
59.	*Sago flour, best sample.*				
	Noodin bin Kali, Malacca	10	0	0	0
	Set Kee Ann, Malacca	0	5	0	0
	Penghulu Mat Sahat, Malacca	0	0	2	0
60.	*Sireh leaves.*				
	Penghulu Mamud, Malacca	5	0	0	0
	Kulop Sotan, Kuala Kangsa	0	3	0	0
	Mohamed Salleh, Penang	0	0	1	0
61.	*Spices, best collection.*				
	D. Mohamed Noor, Penang	10	0	0	0
	Sh. Mohamed Zinalabdin, Penang ...	0	3	0	0
	Mohamed Ariffin, Penang	0	0	2	0
62.	*Sugar Canes.*				
	Leong Lok Hing, Penang	10	0	0	0
63.	*Sugar Canes, best collection of varieties.*				
	Caledonia Estate, P. W., Medal ...	10	0	0	0
64.	*Sugar, Coconut, best sample.*				
	Haji Hamid, Selangor	5	0	0	0
	Penghulu Mohamed	0	3	0	0
	Ismail, Butterworth	0	0	1	0
65.	*Sugar, Nipah, best sample.*				
	Mohamed Salleh, Penang	5	0	0	0
	Babjee, Penang	0	3	0	0
66.	*Sugar, Kabong, best sample.*				
	No Name	5	0	0	0
	Penghulu Haji Rajah, Malacca ...	0	3	0	0
	Penghulu Ujang, Malacca	0	0	1	0
67.	*Sugar (cane) brown, best sample*				
	Leong Lok Hing, Penang	5	0	0	0
	Penghulu Haji Mohamed Akib, Krian ...	0	3	0	0
	Ong Yu Tong Siang, Ek Estate, Krian ...	0	0	1	0
68.	*Sugar (cane) refined white, best sample.*				
	Caledonia Estate, Province Wellesley ...	0	5	0	0
69.	*Tapioca, roots.*				
	Geo. Stothard, Malakoff Estate, P. W. ...	5	0	0	0
	Jatin bin Mat Akib, Nibong Tebal ...	0	3	0	0
	Penghulu Jaffar, Malacca	0	0	1	0
	Carried over	$440	249	77	13

DIVISION *A.—Continued.*

		1st.	2nd.	3rd.	Extra
		$	$	$	$
	Brought forward	440	249	77	13
70.	*Tapioca roots, best collection of varieties.*				
	Penghulu Mohamed Said, Nibong Tebal ...	10	0	0	0
	Alma Estate	0	5	0	0
71.	*Tapioca, pearl, best sample.*				
	Chan Say Peng, Malacca	5	0	0	0
	Penghulu Alom, Malacca	0	3	0	0
	Khoo Soo Tat, Penang	0	0	1	0
	Kung Cheng, Malacca (Special Prize) ...	0	0	0	3
72.	*Tapioca, flake, best sample.*				
	Geo. Stothard, Malakoff Estate, P. W. ...	5	0	0	0
	Chan Koon Cheng, Malacca	0	3	0	0
	Diamond Jubilee Estate	0	0	1	0
73.	*Tapioca, flour, best sample.*				
	Chan Koon Cheng, Malacca	5	0	0	0
	Caledonia Estate, Province Wellesley ...	0	3	0	0
	Sahid bin Lebai Mohamed Saleh, Nibong Tebal	0	0	1	0
74.	*Tapioca, any other preparation.*				
	Geo. Stothard, Malakoff Estate, P. W. ...	5	0	0	0
	C. Tuah Choo, Bukit Mertajam ...	0	3	0	0
75.	*Tea, best sample.*				
	S. M. Peralta, Malacca	10	0	0	0
	Penghulu Tongsah, Malacca	0	5	0	0
76.	*Toddy, best sample.*				
	Pariathumbee Pillai, Penang	0	2	0	0
	Narayanasamy Pillai, Penang (Special Prize)	0	2	0	0
77.	*Tuba (akar) best sample.*				
	H. H. Cornelius, Penang	3	0	0	0
	Ma' akir, Negri Sembilan	0	2	0	0
78.	*Termeric, best sample.*				
	Kung Thean Sung, Penang	5	0	0	0
	Lean Loi Fat, Penang	0	3	0	0
	Wok, Negri Sembilan	0	0	1	0
79.	*Walking sticks, best collection unprepared.*				
	Hassan, Pulau Jerejak	10	0	0	0
	Daub, Malacca	0	5	0	0
	Penghulu Sahid, Malacca	0	0	2	0
80.	C. & R. S. Meikle, Selangor (2nd prize) ...	0	10	0	0
	W. W. Bailey, (1st prize)	15	0	0	0
81.	C. & R. S. Meikle, Selangor (2nd prize) ...	0	10	0	0
	Total ...	513	305	83	16

DIVISION *B.*

Flowers, Fruit and Vegetables.

SECTION I.—FLOWERS.

Ornamental Foliage Plants in Pots.

Class.		1st. $	2nd. $	3rd. $	Extra. $
1.	*Aroids other than Caladiums.*				
	John A. Brown, Penang	3	0	0	0
2.	*Aroids best specimen.*				
	John A. Brown, Penang	2	0	0	0
3.	*Caladiums.*				
	Lim Kean Thuan, Penang	3	0	0	0
4.	*Caladiums.*				
	A. D. Machado	2	0	0	0
6.	*Crotons.*				
	Mr. Schule	3	0	0	0
10.	*Ferns (any variety) distinct.*				
	Mr. Schule	5	0	0	0
	A. Stephen Anthony, Penang	0	2	0	0
16.	*Palms, distinct kinds.*				
	Khau Joo Tok, Penang	10	0	0	0
	John A. Brown, Penang	0	5	0	0
17.	*Palms, best specimen.*				
	A. D. Machado	3	0	0	0
19.	*Selaginella, distinct kinds.*				
	Mr. Schule	3	0	0	0
23.	*Foliage Plant of any kind best specimen.*				
	Mr. D. Logan, Penang	5	0	0	0
	Ornamental Plants in flowers in Pots.				
26.	*Asters.*				
	Contonese Club, Penang	2	0	0	0
31.	*Cockscombs.*				
	Lim Ah Chum, Province Wellesley	2	0	0	0
38.	*Orchid, best specimen.*				
	Arthur Oechsle, Penang	5	0	0	0
41.	*Roses.*				
	Yeoh Cheow Chye, Penang	5	0	0	0
44.	*Best collection of flowering plants distinct kinds.*				
	Cantonese Club, Penang	5	0	0	0
45.	*Best collection of flowering plants (open to Subscribers for flower seeds only.)*				
	L. M. Murray, Penang (Cup)	0	0	0	0
46.	*Best plant in Flower in Show.*				
	Cantonese Club, Penang	5	0	0	0
	Plants whether in Flower or not.				
49.	*Groups of plants arranged for effect in space not exceeding 9 feet square.*				
	Mrs. J. A. Brown, Penang	5	0	0	0
	Carried over,	68	7	0	0

DIVISION *B.—Continued.*

Class.		1st.	2nd.	3rd.	Extra.
		$	$	$	$
	Brought forward,	68	7	0	0
50.	*Group of Chinese Plants of fantastic shape.*				
	Cantonese Club, Penang	5	0	0	0

Cut Flowers and Table Decorations.

Class.		1st.	2nd.	3rd.	Extra.
51.	*Asters.*				
	Khoo Moh Kaw, Penang	2	0	0	0
52.	*Bridal Bouquet.*				
	Miss V. Brown, Penang	5	0	0	0
53.	*Button-holes and Sprays.*				
	Miss Constance Law, Penang	3	0	0	0
55.	*Cut Flowers arranged for effect.*				
	Miss Violet Brown, Penang	3	0	0	0
56.	*Wild Flowers arranged for effect.*				
	K. Bromhead Matthews, Penang	3	0	0	0
57.	*Dahlias.*				
	Yeoh Cheow Chye, Penang	2	0	0	0
58.	*Hand bouquet.*				
	A. D. Machado	3	0	0	0
59.	*Roses.*				
	Yeoh Cheow Chye, Penang	2	0	0	0
60.	*Table Decoration.*				
	Mrs. Fox (Cup)	0	0	0	0

SECTION II.—FRUITS.

Class.		1st.	2nd.	3rd.	Extra.
61.	*Bananas, "Pisang," best collection.*				
	Takaya B. H. Mohamed, Penang	0	5	0	0
62.	*Bananas, "Pisang" best bunch any kind.*				
	Serban, Negri Sembilan	3	0	0	0
	David Brown, (extra prize)	3	0	0	0
63.	*Champedak.*				
	Chow Soon Soo, Penang	2	0	0	0
	Penghulu Mat Said	0	1	0	0
64.	*Chiku.*				
	Lim Kek Chuan, Penang	3	0	0	0
	D. Logan, Penang	0	2	0	0
65.	*Custard Apple.*				
	Ahmad bin Mat Tahir, Province Wellesley	2	0	0	0
66	*Cultivated fruits, best collection any number.*				
	D. Logan, Penang (Cup)	0	0	0	0
	Ong Chooi, Penang	0	5	0	0
67.	*Cultivated fruits, best collection 6 distinct kinds.*				
	Mohamed Zain, Penang	0	3	0	0
68.	*Durian.*				
	Braheim bin Haji Meran, Penang	5	0	0	0
	Kung Thean Sung, Penang	0	2	0	0
69.	*Durian Blanda.*				
	Chin Kim Toon, Penang	2	0	0	0
	Carried over,	$116	25	0	0

DIVISION *B.—Continued.*

		1st.	2nd.	3rd.	Extra.
		$	$	$	$
	Brought forward	116	25	0	0
70.	*Duku.*				
	M. Dahalun	0	2	0	0
71.	*Binjai.*				
	Shaik Mohamed Oosman, Penang	2	0	0	0
	Penghulu Mat Bhing, Malacca	0	1	0	0
72.	*Jack fruit.*				
	Muntri Tengah, Malacca	2	0	0	0
73.	*Jambu.*				
	Yeoh Cheow Chye, Penang	2	0	0	0
74.	*Langsat.*				
	Che Lah C. H. Din, Penang	2	0	0	0
	Ahmad bin Mat Tahir, Province Wellesley	0	1	0	0
75.	*Limes.*				
	A. D. Machado	5	0	0	0
	Alang Daud, Kuala Kangsa	0	3	0	0
77.	*Machang.*				
	Janudin bin Abu, Malacca	2	0	0	0
	Anjang Yusuf, (extra prize)	2	0	0	0
78.	*Mangosteens.*				
	Haji Mohamed Saman, Penang	5	0	0	0
	D. Logan, Penang	0	3	0	0
79.	*Mata Kuching.*				
	Haji Mat Tapah, Penang	2	0	0	0
80.	*Melon, any kind.*				
	Penghulu Mat Hassan, Province Wellesley	3	0	0	0
81.	*Papaya.*				
	Mustapa bin Abu Bahar, Province Wellesley	3	0	0	0
82.	*Oranges.*				
	Kim Keat, (Singapore)	3	0	0	0
	W. J. Coates, Negri Sembilan	0	2	0	0
83.	*Pineapple (Mauritius.)*				
	Abdulrahman, Penang	3	0	0	0
	C. Tuah Choo, Bukit Mertajam	0	2	0	0
84.	*Pineapple (any other variety.)*				
	H. Wahid bin Mohamed, Malacca	3	0	0	0
	Titah, Negri Sembilan	0	2	0	0
	Rajah Haji Tahya, (Special prize)	0	2	0	0
85.	*Pomeloes.*				
	A. D. Machado	2	0	0	0
	Ali bin Esope, Penang	0	1	0	0
86.	*Pulasan.*				
	K. Bromhead Matthews, Penang	2	0	0	0
	Ali bin Esope, Penang	0	1	0	0
87.	*Rambai.*				
	Ali bin Esope, Penang	2	0	0	0
	C. J. Williams, Bukit Mertajam	0	1	0	0
	Carried over	161	46	0	0

DIVISION *B.—Continued.*

Class.		1st. $	2nd. $	3rd. $	Extra. $
	Brought forward	161	46	0	0
88.	*Rambutan.*				
	Lim Kek Chuan, Penang	2	0	0	0
	A. O. Merican, Penang	0	1	0	0
89.	*Wild edible fruits, best collection.*				
	Penghulu Mat Sahat, Malacca	5	0	0	0
	Yab, Penang	0	3	0	0
90.	*Any kind of fruit not included in the above.*				
	R. Douglas Tollemache, Selangor	3	0	0	0
	Penghulu Telok Bahru	0	2	0	0
	Preserved Fruits and Vegetables.				
91.	*Preserved fruits, best sample any method.*				
	Mohamed Kassim, Penang	10	0	0	0
	Penghulu Amat, Malacca	0	5	0	0
	Penghulu Mamud, Malacca (Special prize)	0	0	3	0
	Halimah, Malacca	0	0	3	0
93.	*Pickles.*				
	M. Pasqual, Penang	5	0	0	0
94.	*Jellies.*				
	Awang, Penang	0	3	0	0
97.	*Benny Fruits.*				
	Nai Kong, Penang	2	0		0
98.	*Brinjals.*				
	John Lamb	2	0	0	0
99.	*Beans, best collection.*				
	Kung Thean Sung, Penang	3	0	0	0
	Mohamed Hashime, Penang	0	2	0	0
100.	*Cabbages.*				
	Chong Ah Yong, Penang	2	0	0	0
101.	*Chillies, best collection.*				
	A. D. Machado	3	0	0	0
	Kung Thean Sung, Penang	0	2	0	0
102.	*Cucumbers.*				
	Penghulu Mat Hassan, Bukit Mertajam	2	0	0	0
103.	*Herbs used in curries and sambals, best collection.*				
	Shaik Hossain, Penang	2	0	0	0
104.	*Ladies Fingers.*				
	Kung Thean Sung, Penang	2	0	0	0
105.	*Lettuces.*				
	Chong Ah Yong, Penang	2	0	0	0
106.	*Onions, shallots and garlic, best collection.*				
	Kung Thean Sung, Penang	2	0	0	0
107.	*Pumpkins.*				
	Mat Taib, Krian	2	0	0	0
108.	*Radishes.*				
	Takaya bin Haji Mohamed, Penang	2	0	0	0
110.	*Vegetables, best collection.*				
	G. B. Cerruti, Perak	5	0	0	0
	Carried over	217	64	6	0

DIVISION *B.—Concluded.*

Class.		1st.	2nd.	3rd.	Extra.
		$	$	$	$
	Brought forward	217	64	6	0
113.	*Yams, Kladi and Sweet potatoes, best collection.*				
	Alli, Penang	5	0	0	0
	Kung Thean Sung, Penang	0	3	0	0
114.	*Any Vegetable not in the above.*				
	Alli, Penang	3	0	0	0
	Total ...	$225	67	6	0

DIVISION *C.*

Stock and Dairy Produce.

Class.		1st.	2nd.	3rd.	Extra.
		$	$	$	$
1.	*Bull, locally bred.*				
	Mahomed Ariff, Penang	20	0	0	0
	Puteh, Penang, (Extra)	0	0	0	10
4.	*Bull or Bullock imported, Peninsular.*				
	D. Douglas, Province Wellesley ...	20	0	0	0
6.	*Cow and Calf imported, Indian.*				
	D. Logan, Penang	20	0	0	0
8.	*Bull or Bullock, Peninsular, best.*				
	Puteh, Penang	0	10	0	0
9.	*Buffalo Bull.*				
	Lye Thoon	15	0	0	0
16.	*Best pen of 6 pigs*				
	Sung Hup, Penang	0	10	0	0
	Sung Leong, Penang, (Extra prize) ...	0	0	0	10
17.	*Best pig over 300 catties.*				
	Soo Swee	0	10	0	0
19.	*Goat, Ram.*				
	Plot bin Noh, Nibong Tebal	10	0	0	0
	Kamaludin bin Haji Bahudin, Penang ...	0	5	0	0
20.	*Goat, Ewe with kids.*				
	Plot bin Noh, Nibong Tebal	10	0	0	0
21.	*Sheep, Ram.*				
	M. Gregory, Penang	10	0	0	0
22.	*Sheep, Ewe.*				
	W. Yang Beng, Penang	10	0	0	0
25.	*Bantam Cock and Hen.*				
	Mrs. D. Logan, Penang	5	0	0	0
	Khoo Moh Kow, Penang	0	3	0	0
26.	*Malay Cock and Hen.*				
	Law Chit Man, Penang	5	0	0	0
	Penghulu Lenggong, U. Bernum ...	0	3	0	0
	Carried over,	$125	41	0	20

DIVISION *C.—Continued.*

		1st. $	2nd. $	3rd. $	Extra $
	Brought forward,	125	41	0	20
27.	*Malay Game Cock and Hen.*				
	Penghulu of Pulau Tiga, Lower Perak	5	0	0	0
	Haji Pachee, Penang	0	3	0	0
28.	*Collection of Malay Fowls.*				
	W. Willis Douglas	10	0	0	0
	Shaik Moh Osman, Penang	0	5	0	0
	Kung Thean Sung, Penang (Extra prize)	0	0	0	5
30.	*Collection of Fowls, any breed.*				
	L. E. P. Wolferstan	10	0	0	0
	K. Bromhead Matthews	0	5	0	0
	Braheim, Botanic Gardens, Penang (Extra prize)	0	0	0	5
31.	*Pair of Muscovy Ducks, Duck and Drake.*				
	K. Bromhead Matthews	10	0	0	0
	Jahaya bin Mat Aris, Krian	0	5	0	0
32.	*Pair of Manila Ducks.*				
	Syed Sallim, Penang	5	0	0	0
	Mustapa bin Abu Baker	0	3	0	0
	Moonah, Penang (Extra prize)	0	0	0	3
33.	*Pair of Ducks, any breed, Duck and Drake.*				
	H. Oathman, Butterworth	5	0	0	0
	Kung Thean Sung, Penang	0	3	0	0
35.	*Gander and Goose.*				
	Mrs. D. Logan, Penang	5	0	0	0
	K. Bromhead Matthews	0	3	0	0
37.	*Pair of Guinea Fowls, Cock and Hen.*				
	Mrs. D. Logan	5	0	0	0
38.	*Pair of Pigeons, any breed.*				
	Mrs. D. Logan	5	0	0	0
	Extra prize $3.				
	Penghulu Haji Salleh, P. W. (Extra prize)	0	0	0	3
40.	*Best Bird in the Show.*				
	H. Wool	10	0	0	0
42.	*Pair of Guinea Pigs.*				
	J. Bromhead Matthews	5	0	0	0
43	*Sample of Butter.*				
	H. H. Cornelius, Penang	10	0	0	0
	Geo. Stothard, Malakoff Estate	0	5	0	0
	Extra prize.				
44.	*Collection of Eggs, Fowls' or Ducks'.*				
	Awang, c/o Mrs. Kate Matthews	5	0	0	0
	L. E. P. Wolferstan	0	3	0	0
	Haji Mohamed Sahat, Penang, (Special prize)	0	0	0	3
	Total	$215	76	0	39

DIVISION *D*.

Horses and Dogs.

Class.		1st.	2nd.	3rd.
		$	$	$
1.	*Polo Pony, registered 14.1 or under.*			
	Capt. A. Mc. D. Grahams "Bessie" (Cup)			
	Mrs. M. Suhls "Happy Chance" (Medal) ...	0	10	0
2.	*Gentleman's Hack, 14.2 and under.*			
	C. R. Molyneux's "The Friar" (Cup)			
	W. H. MacArthur "Bubbles" (Medal) ...	0	10	0
	G. H. Stitts "Patrick" (Cup)			
3.	*Gentleman's Hack, over 14.2.*			
	O. Sielckens "Mantred" (No second prize)			
4.	*Lady's Hack over 14.2, to be shown under saddle and ridden by a Lady.*			
	Mrs. Jamieson's "Nickolas" (Cup)			
	Mrs. J. A. Murray's "Puritan Lass'	0	10	0
5.	*Lady's Hack 14.2 and under, to be shown under saddle and ridden by a Lady.*			
	Mr. M. Thornton's "Georgina" Bracelet			
	Mr. MacArthur's "Bubbles" (Medal)	0	10	0
6.	*Best Gharry and Pony, 14.2 and under, to be shown in cart or carriage.*			
	Mr. Lim Chee Siang, Medal and $10	0	10	0
	Mr. Hudson's	0	10	0
7.	*Single Harness Pony 14.2 and under, to be shown in cart or carriage.*			
	Khaw Joo Keat's (Cup) ...			
	W. W. Douglas	0	10	0
8.	*Single Harness Horse over 14.2 and under, to be shown in cart or carriage.*			
	Mr. H. Wool	20	0	0
	Mr. G. H. Stitt "Patrick"	0	10	0
9.	*Registered Gharry Pony of any description: the boná fide property of a licensed Gharry owner (Australian horse barred.)*			
	No entry			
10.	*Jumping Pony 14.2 and under, to be ridden over at least four jumps.*			
	Capt. MacIntyre, "Sadi" (Cup)			
	Mr. Suhls "Happy chance"	0	10	0
11.	*Jumping Horse over 14.2, to be ridden over at least four jumps.*			
	C. R. Molyneux "Chieftain" (Cup)			
	G. H. Stitts "Patrick"	0	10	0
12.	*Single Turnout.*			
	G. B. Whitehead "Billy" (Cup)			
	H. Wool	0	10	0
	Carried over,	$20	130	0

DIVISION *D.—Continued.*

Class.		1st.	2nd.	3rd.
		$	$	$
	Brought forward,	20	130	0
13.	*Double Turnout, of any description, pairs, tandems, etc.*			
	Cheang Thye Pin, (Cup) ...			
	Chea Tat Toi	0	10	0
14.	*Gharry Turnout, the boná fide property of a licensed gharry owner.*			
	No entry			
15.	*Shandrydan Turnout, the boná fide property of a licensed Shandrydan owner.*			
	No entry			
16.	*The best all round Horse 14.2 or over in the Show: to be shown on the halter.*			
	G. H. Stitt "Patrick" (Cup)			
17.	*The best all round Pony 14.2 and under to be shown on the halter.*			
	G. B. Whitehead "Billy" (Cup)			
18.	*The best Straits Settlements or Native States bred horse or mare, any age over 12 hands.*			
	Geo. Stothard, (Cup)			
	Total ...	20	140	0

DIVISION *E.*

Native Industries and Manufactures.

Class.		1st.	2nd.	3rd.
		$	$	$
1.	*Ornamental Baskets.*			
	Mahani bin Mamud, Malacca	10	0	0
	Penghulu of Bandar, Lower Perak	0	5	0
2.	*Lace work (biku)*			
	Penghulu Baba Pringgit, Malacca	10	0	0
	Mohamed Kassim	0	5	0
3.	*Leather work.*			
	Haji Salam, Penang	10	0	0
4.	*Rope and Twine.*			
	J. Abrams, Penang	10	0	0
	Penghulu of Pulau Tiga, Lower Perak	0	5	0
5.	*Tali Ijok.*			
	Noodin bin Kali, Malacca	10	0	0
	Penghulu of Bachang, Malacca	0	5	0
6.	*Attaps.*			
	Penghulu of Kota Stia, Lower Perak	10	0	0
	Penghulu of T. Baharu, Lower Perak	0	5	0
7.	*Kajangs.*			
	Penghulu of Pulau Tiga, Lower Perak	10	0	0
	Penghulu of T. Baharu, Lower Perak	0	5	0
	Carried over	$70	30	0

DIVISION *E.—Continued.*

Class.		1st.	2nd.	3rd.
		$	$	$
	Brought forward,	70	30	0
8.	*Chicks.*			
	D Mohamed Noor, Penang	10	0	0
	Arifin, Penang	0	5	0
9.	*Mats.*			
	L. Daud. Krian	10	0	0
	Penghulu Jaffar, Malacca	0	5	0
10.	*Mats Rotan.*			
	Asin, Krian	10	0	0
11.	*Malay Mats (Padanus.)*			
	Haji Mohamed Sahaat, Penang	10	0	0
	Haji Mohamed Rasaid, Penang	0	5	0
12.	*Hats,*			
	Haji Salam, Penang	10	0	0
	Penghulu of Bagan Dato, Lower Perak	0	5	0
13.	*Brushes and Brooms.*			
	Shaik Hossain, Penang	10	0	0
	D. Mohamed Noor, Penang	0	5	0
14.	*Coco-Nut Palms, Collection of articles manufactured from.*			
	Mohamed Akib, Butterworth	10	0	0
	Muntri Tengah, Malacca	0	5	0
15.	*Kabong (arenga.)*			
	Kulop Mohamed Ali, Kuala Kangsa	10	0	0
16.	*Nibong.*			
	No Prize			
17.	*Sireh apparatus set.*			
	Mohamed Hussein, Province Wellesley	10	0	0
	Haji Mohamed Salleh, Negri Sembilan	0	5	0
	Said (Special prize)	0	5	0
18.	*Model Malay House.*			
	Kwala Muda, c/o A. D. Neubronner	10	0	0
	Kulop Lotan, Kuala Kangsa	0	5	0
19.	*Model Fishing stakes.*			
	Penghulu Yusof, Malacca	10	0	0
	Lebei Sidik, Butterworth	0	5	0
20.	*Model Snares and Traps.*			
	Ahmad bin Mohamed Taib, Butterworth	10	0	0
	D. Mohamed Noor, Penang	0	5	0
21.	*Wood carving 1 piece.*			
	Penghulu H. Mohamed Akib, Krian	10	5	0
	Penghulu Abdul Majid, Selangor	0	5	0
	L. E. P. Wolferstan (Special prize)	0	5	0
22.	*Embroidery 1 piece.*			
	Malay Art School, Kuala Kangsa	10	0	0
	Penghulu Dol C. Bidin, Malacca	0	5	0
23.	*Sarong Silk.*			
	Mohamed Yatim, Kuala Kangsa	10	0	0
	Shaik Mohamed, Penang	0	5	0
	Carried over,	$220	110	0

DIVISION *E.—Continued.*

		1st.	2nd.	3rd.
		$	$	$
	Brought forward,	220	110	0
24.	*Sarong cotton.*			
	Mad Saman, Kuala Kangsa	10	0	0
	Moh Arshat, Butterworth	0	5	0
25.	*Brass ware.*			
	Narayanasamy Pillai, Penang	10	0	0
	Haji Mohamed Sahid, Penang	0	5	0
26.	*Silver ware.*			
	Chas. G. Garrard, Malacca	10	0	0
	To Gampar Maharaja Zacharia, Negri Sembilan	0	5	0
27.	*Tin ware.*			
	Lam Chay, Negri Sembilan	10	0	0
	Kwan Fun, Negri Sembilan	0	5	0
28.	*Krisses sheaths and knife handles.*			
	To Gampar Maharaja, Negri Sembilan	10	0	0
	Koo Aim K. Kudam, Penang	0	5	0
29.	*Fishing Nets.*			
	Haji Mustapa, Penang	10	0	0
	Bakar Bin Omar, Butterworth	0	5	0
30.	*Sakei articles.*			
	G. B. Cerruti, Perak, Medal and Diploma	10	0	0
	Pan Dewa Sakti, Batang Padang, Perak	0	5	0
31.	*Collection of photographs illustrating native life or industries.*			
	No Prize			
32.	*Miscellaneous.*			
	H. Mohamed, Penang	10	0	0
	Kuala Muda, c/o A. D. Neubronner	0	5	0
	Total	300	150	0

DIVISION *E.*

SECTION I.

Native Industries and Manufactures confined to Competitors from Schools of the Colony and Malay Peninsula.

Class.		1st.	2nd.	3rd.
		$	$	$
1.	*Malay hand-made Pottery.*			
	Larut	10	0	0
	Krian	0	5	0
2.	*Ornamental Baskets.*			
	Lower Perak	10	0	0
	Upper Perak	0	5	0
3.	*Malay Mats (Pandanus).*			
	Krian	10	0	0
	Kuala Kangsa	0	5	0
	Carried over	$30	15	0

DIVISION *E*—SECTION I.—*Continued.*

Class.		1st. $	2nd. $	3rd. $
	Brought forward	30	15	0
4.	*Sireh Apparatus, set.*			
	No Prize			
5.	*Model, Malay House.*			
	Kuala Kangsa	10	0	0
	Krian	0	5	0
6.	*Model, Fishing Stakes.*			
	Krian	10	0	0
	Matang	0	5	0
7.	*Wood carving.*			
	Larut	10	0	0
	Kinta	0	5	0
8.	*Embroidery.*			
	Lower Perak	10	0	0
	Kuala Kangsa	0	5	0
9.	*Sarong, silk.*			
	Krian	10	0	0
	Matang	0	5	0
10.	*Sarong, cotton.*			
	Krian	10	0	0
	Lower Perak	0	5	0
11.	*Snares, etc., collection.*			
	Larut	10	0	0
	Krian	0	5	0
12.	*Fishing Nets.*			
	Lower Perak	10	0	0
13.	*Miscellaneous.*			
	Kuala Kangsa	12	0	0
	Kuala Kangsa	0	5	0
	Total ...	122	55	0

DIVISION *F.*

Agricultural Implements and Miscellaneous.

Class.		1st. $	2nd. $
1.	*Padi Implements (Collection).*		
	Abdulrahman bin Md. Said, Nibong Tebal	10	0
	Md. Kassim, Extra prize	0	5
	Penghulu of Pulau Tiga, Lower Perak	0	5
2.	*Agricultural Implements, other than for Padi or Rubber, locally made.*		
	Khamis, Butterworth	10	0
	Penghulu Yusof, Malacca, Extra prize	0	5
	Md. Kassim, Penang		5
3.	*Agricultural Implements, European made.*		
	McAlister & Co., Penang	10	0
	Carried over,	$30	20

DIVISION *F.—Continued.*

Class.		1st. $	2nd. $
	Brought forward	30	20
4.	*Bullock Cart.*		
	McAlister & Co., Penang	10	0
5.	*Hand Cart.*		
	No Prize		
6.	*Building Bricks.*		
	Penghulu Indut, Kuala Kangsa	10	0
	Penghulu Indut, Kuala Kangsa, Extra prize	0	5
	Tan Ong Peng, (Extra prize)	0	5
	C/o H. C. Sells, Nibong Tebal	0	5
7.	*Roofing Tiles.*		
	Penghulu Indut, Kuala Kangsa	10	0
	Tan Choon Lean, Butterworth	0	5
	Penghulu Shaik Yabya, Extra	0	5
8.	*Flooring Tiles.*		
	Tan Ong Peng, Kuala Kangsa, Medal	10	0
	Caledonia Estate, Province Wellesley	0	5
9.	*Malay hand-made Pottery.*		
	Abdul Wahid, Krian	10	0
	Penghulu of Pulau Tiga, Lower Perak	0	5
10.	*Fancy Pottery.*		
	Malay Art School, Kuala Kangsa	10	0
	Penghulu of Pulau Tiga, Lower Perak	0	5
11.	*Agricultural Baskets.*		
	Syed Ali, Penang	10	0
	Mukin Ijok, Perak	0	5
12.	*Casks, Tubs, etc.*		
	Penghulu Yusof, Malacca	10	0
13.	*Carriages four wheels, Phaeton or Waggonette.*		
	C. Chin Seng, Penang, Medal	10	0
14.	*Carriages, four wheels, Landau or Victoria.*		
	C. Chin Seng, Penang, Medal	10	0
15.	*Carriages, two wheels with hood.*		
	No entries		
16.	*Carriages, two wheels without hood.*		
	C. Chin Seng, Penang, Medal	10	0
17.	*Flower Pots, sizes from 2 in. to 18 in. diameter.*		
	Bagan Dalam Chetty, Butterworth	10	0
	Minagapa, Butterworth	0	5
18.	*Garden Furniture, Garden Seats.*		
	No Entry		
19.	*Garden Furniture, Arbours, trellis work, etc.*		
	No Prize		
20.	*Hack Gharry.*		
	C. Chin Seng, Penang, Medal	10	0
21.	*Hack Gharry, Improved Construction.*		
	No Prizes		
	Carried over	$160	70

DIVISION *F.—Continued.*

		$	$
	Brought forward,	160	70
22.	*Shandridan (two wheel Gharry.)*		
	C. Chin Seng, Penang, Medal	10	0
	Mat, Penang	0	5
23.	*Shandridan, Improved Construction.*		
	No Prizes		
24	*Best Exhibit of mining implements.*		
	No Prizes		
25.	*Miscellaneous.*		
	Mahmud, Penang	10	0
	Hassim bin Kadir	0	5
	Penghulu Haji Mohamed, Extra	0	5
	Total ...	180	85

		$	c.
DIVISION	*A.*	917	00
Do.	*B.*	298	00
Do.	*C.*	330	00
Do.	*D.*	140	00
Do.	*E.*	450	00
Do.	*E. Section 1.* ...	177	00
Do.	*F.*	265	00
	Grand Total ...	2,577	00

W. FOX,
Honorary General Secretary.

AGRICULTURAL SHOW, PENANG, 1905.

DIPLOMAS WERE AWARDED

TO THE FOLLOWING:

DIVISION *A*.

Mr. Norris	For	Arrowroot.
„ Pryor	„	Copra Sun-dried.
„ Chong Kim On	„	Nutmegs.
Caledonia Estate	„	Dry Indigo.
Mr. Kon Lean Seng	„	Mace.
„ A. C. Hardouin	„	Essential Oil.
„ Kung Thean Sung	„	Turmeric.
„ Bailey	„	Rubber class (54)
„ E. B. Prior	„	Rubber (Rambong)
„ E. B. Prior	„	Coconuts, best Coll:
„ Haji Hamid	„	Sugar (Coconut)
„ D. Logan	„	Cotton "Kapas"
Malakoff Estate	„	Tapioca, flake.
Penghulu Che Puteh	„	Padi, any variety.
Gapis Estate	„	Pepper, white.

DIVISION *B*.

Mr. Hamid Ampagan	For	Preserved fruits.
„ Khoo Joo Tok	„	Palms.
„ Coates	„	Avocado pears.
Penghulu Mat Hassan	„	Watermelons.
Mr. Machado	„	Lemons.
„ Tan Poh Guan	„	Binjai.
„ D. Logan	„	Collection of Fruits.

DIVISION *E*.

Mr. L. E. P. Wolferstan	For	Wood Carving.
„ Chas. Garrard	„	Silver Ware.
Mahanib Mamat	„	Ornamental Baskets.
Penghulu Baba, Pringgit	„	Lace work.
Noodin bin Kali	„	Tali Ijok.
Asiah	„	Hats.
Mohamed Akib	„	Coconut Palms, Coll:
Penghulu Dol	„	Embroidery.
Rajah Bila	„	Do.
Moh. Yatim	„	Sarongs, Silk.
Narayanasamy Pillai	„	Brassware.
To Gampar Maharaja Zacharia	„	Silverware.
Lam Chay	„	Tinware.
Kwan Fun	„	Do.
Mustapa	„	Kriss handles.
Haji Mustapa	„	Fishing Nets.
Mr. G. B. Cerruti	„	Sakai Articles.
Major De Hamel	„	Miscellaneous exhibits.

DIVISION *E., Section 1, Schools only.*

S. Krian School	...	...	For	Ornamental Baskets.
L. Perak School	...	...	,,	Embroidery.

DIVISION *F.*

W. R. Swan	...	...	For	Machinery in connection with Tapping and preparing rubber.
Caledonia Estate	...	...	,,	Roofing Tiles.

W. FOX,
Honorary General Secretary.

WATER AND ITS RELATIONS TO PLANT LIFE.

Of the various factors affecting plant life, none is more important than water. Without water there can be no life, though the amount necessary to bring about full development varies very considerably in different plants. As the conditions under which plants live are not constant, we find a corresponding variation in the manner in which they have adapted themselves to the varying conditions; thus while some plants such as pine-apples, cacti and other desert plants may lie uprooted and exposed to the sun for weeks without suffering any injury, others such as aquatics are quickly killed by exposure to a moderately dry atmosphere.

Water forms the chief constituent of living plants, amounting to no less than 96 per cent. of the total weight in the case of succulents, and, among other important functions is indispensable as a medium for the transportation and introduction into the plant, of the nutrient substances occurring in the soil: the whole of the plant food obtained from the soil entering the plant through this medium, while its elements—hydrogen and oxygen—also enter into the various organic compounds of plant life.

A large amount of the water taken up by the roots from the soil is retained by the plant; though a still larger quantity is transpired through the leaves, the various salts and other substances held in suspension being deposited in the plant. The actual quantity of water evaporated by the leaves is enormous; it has been calculated for example, that a well developed Birch tree standing perfectly free, would lose by evaporation on a hot dry day over 400 litres of water. An ordinary field crop transpires about 300 lbs. of water for each pound of dry matter produced; so that in the case of an acre of marigolds yielding say 30 tons at harvest, and containing 88 per cent. of water, the amount of water transpired during growth would be no less than 1,080 tons per acre. The amount of water transpired by hops during growth, reaches from 3-4,000.000 litres per acre.

In the British Isles, this represents more than half the total annual rainfall, so that when we consider that a large percentage of the rain runs straight off the ground and is lost to the plant, and that a further quantity is lost by evaporation from the soil, we shall see how, even in a humid climate, the available water supply may easily fall below the amount necessary to bring about maximum development. This is equally true of the tropics, where the loss due to evaporation is much greater than in temperate regions, and where, owing to the amount of rainfall in a given time being relatively greater than in countries beyond the equatorial zone, the loss of water to the plant through the water running straight off the ground is considerably higher: this however is counteracted to some extent by the heavier *annual* rainfall. We thus see the value of "shade trees" on newly cleared and planted ground, which by breaking the force of the rain, and by lessening the amount of evaporation due to direct insolation, tend to increase the amount of water available for the plant.

Other conditions being equal, it may be regarded as a fact that water plays a more important part in determining the yield of a crop, than manure or any other essential of plant life; and one has only to compare the growth and returns from coffee and other products grown on hill and alluvial soil respectively, or of padi grown on dry and on irrigated land, to see how true this is of this part of the tropics.

The whole of the plant food obtained from the soil must enter the plant in a liquid state, as it is only in this condition that it can pass through the cell walls; and as the watery fluid taken up by the roots contains but a very minute quantity of plant food, the plant is compelled to take up more water than is necessary for its immediate requirements, in order to secure a sufficient quantity of the various salts and oxides which are held in solution. The surplus water thus absorbed, simply as a medium for the transportation of the plant food, is transpired through the leaves, and, though to a less extent, through the stem and other parts of the plant: thus a current of water known as the transpiration current is maintained, fresh supplies passing into the plant through the roots, and passing up through the wood cavities, to make good the loss due to transpiration. If for any reason the supply of water is insufficient to compensate for the loss due to transpiration, the plant wilts; and it is due to this fact that a cut branch withers and dies.

Transpiration is promoted by numerous small openings in the epidermis of the leaves, known as stomata. These stomata are most generally found on the under surface of the leaf, though in some plants where the leaves are placed more or less vertically, as in the Yucca, they occur in about equal numbers on both the under and the upper surface. These pores though very minute, are usually present in enormous numbers; it being estimated that 160,000 occur within the space of a square inch of the under surface of the leaf of the Lilac; while an ordinary Sunflower leaf is provided with no less than 13,000,000.

It will be seen therefore, that though the stomata are so minute that liquid water cannot pass through them, evaporation in the form of a watery vapour is greatly facilitated, owing to the enormous numbers in which they occur; a large number of small openings being much more effective than a small number of large ones.

The amount of transpiration however, can be regulated, and where the external conditions are such that active transpiration would be injurious to the plant, the stomata can be closed and transpiration thereby checked; each stoma being provided by two guard cells which, when acted upon by various stimuli, have the power of closing the pore.

(*To be continued.*)

STANLEY ARDEN,
Superintendent, Experimental Plantations,
Selangor.

RUBBER IN SARAWAK.

The first Rubber trees planted in Sarawak were from seed imported from the Botanic Gardens, Singapore, in 1881, by the Right Reverend Bishop HOSE, and were almost, if not quite, the first seed produced by the old trees, which as seedlings were obtained from Kew in 1875. One of these trees is still standing in the Bishop's garden at Kuching and two more in the garden of the Resident. The former measures 6 feet 4 inches in girth at three feet from the ground and the others are nearly as large. The remainder of the trees have disappeared.

I could not find that any more were planted in this district till about five years ago, when a small number were planted in the Coffee Estate on the slopes of Mount Matang. This hill consists exclusively of sandstone, and the soil on the slopes is very sandy with masses of rock and boulders scattered over it. It has for some time been planted with coffee, tea, rubbers and Mauritius hemp (*Fourcroya*). The soil is hardly suitable for cultivation, but the Tea and Coffee are still kept up and worked. The Mauritius hemp seems the only plant in cultivation which thrives. The Para Rubber trees, now five years old, are about the size of what one expects of two year old plants or less, though perhaps a little thicker at the base. *Ficus elastica* does a little better at the base of the hill, but many of the plants looked burnt and sickly higher up. Ceara Rubber seemed worst of all, one would have thought that this plant if any rubber plant would have thriven in the sterile sandy soil of this hill slope, but it was wretched. Many of the trees had fallen, others remained as dead stumps, or if alive bore only a few struggling leafy branches. One may conclude perhaps, safely, that if this sandy desert plant will not grow on these sandy sterile slopes here, it cannot be expected to succeed in other parts of the Malay region. Round Kuching, in the Cemetery and along the roads, a good many Para rubber trees have been planted lately, and seem to be doing fairly well, though it is too soon yet to form an opinion of them.

I visited the plantations at Perak where Mr. BALLINGALL kindly showed me what had been done. The rubber plantation, an extensive area, was on sandy hills with steep slopes, and was planted up with a large number of young plants. These in the lower damper spots were making very fair growth. But in some spots by the streams which looked at first sight favourable, the plants had utterly failed. Examination of the soil showed these spots were remarkably sandy, confirming the opinion that Para rubber dislikes sandy soil more than any other. On the tops of the hill ridges again the young plants were obviously suffering from the wind to which they were exposed. On a few slopes the plants though protected from wind, and in fairly good soil appeared also not to thrive. This I believe was due to underground water currents, especially as in one or two of these slopes springs ran out at the base.

Many people probably know that isolated trees on hill slopes usually do not thrive as well if they grow at all, as those at the top and bottom of the slopes. This appears to be due to the action of underground water currents which interfere with the growth or action of roots.

The greater part of the hills of Sarawak, at least that portion which I have seen, are sandstone or limestone, and a great area of the diluvium of the lower country is therefore very sandy. But the Lundu Hills which I visited are granitic, composed of a fine-grained granite. Below the base of the hills is a flat open plain of considerable size, formerly cultivated with Tobacco. The soil here is less sandy and more argillaceous, with sandy mounds or small hills scattered about it. This seemed to be the most suitable ground for Para rubber I saw in Sarawak, and it is here that Mr. MOIR has secured a concession for rubber planting. The soil is fairly dry, and full of humus for a considerable depth. A good deal of pepper has been planted here on the sandier spots. Another likely spot is along the Kuching River near Santubong, I had not time to visit this but heard that somewhere here Chinese were planting Para-rubber.

H. N. RIDLEY.

REGISTER OF RAINFALL AT NEGRI SEMBILAN HOSPITALS, FOR JULY, 1905.

Date.	Seremban.		K. Pilah.		Tampin.		Jelebu.		Port Dickson.		Mantin.	
	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.
1	...	73	...	60	...	30	...	95	..	08	...	48
2	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	10	...	...	...	...	...	08	...	64
4	1	30	...	05	...	...	...	10	1	85	...	31
5	...	...	...	...	1	30	...	...	...	...	...	...
6	1	42	...	20	...	60	...	27	...	...	...	47
7	...	...	...	...	...	...	...	...	...	...	...	57
8	...	...	...	...	...	55	...	...	...	15	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...
10	...	03	...	80	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	05	...	...	...	29
13	...	...	...	...	...	...	...	...	...	...	...	...
14	1	62	...	10	1	10	...	05	...	68	...	42
15	...	...	...	...	...	60	...	10	1	55	...	45
16	...	80	...	30	2	00	...	76	...	...	...	35
17	...	...	...	...	...	...	...	...	1	45	...	03
18	...	31	...	...	...	10	...	42	...	...	...	79
19	...	39	...	20	2	20	...	43	1	86	...	10
20	1	10	1	05	2	95	...	52	...	85	...	66
21	...	...	...	...	...	...	...	...	1	29	...	02
22	...	21	...	..	...	51	...	10	...	15	...	28
23	1	42	...	...	...	10	...	12	...	75	...	08
24	...	...	...	...	...	30	...	...	...	15	...	...
25	...	...	...	...	...	13	...	12	...	...	...	28
26	...	...	...	...	...	05	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...
28	...	23	...	...	...	...	...	...	...	09	...	...
29	...	05	...	...	...	02	...	...	...	...	...	...
30	...	...	...	60	...	02	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...
Total	9	61	4	00	12	83	3	99	10	98	7	22

STATE SURGEON'S OFFICE,
SEREMBAN, 11*th August*, 1905.

R. VAN GEYZEL,
Apothecary.

SINGAPORE MARKET REPORT.

August, 1905.

Articles.	Quantity sold.	Highest price.	Lowest price.	
	Tons.	$ c.	$ c.	
Coffee—Palembang	...	No quotation		
Bali	76	22.00	22.00	
Liberian	132	24.50	22.50	
Copra	4,756	7.50	6.80	
Gambier	1,952	9.00	8.50	
Cube Gambier, Nos. 1 & 2	221	12.75	11.50	
Gutta Percha, 1st quality	...	300.00	150.00	
Medium	...	200.00	90.00	
Lower	...	80.00	12.00	
Borneo Rubber 1, 2, and 3	...	142.00	92.00	
Gutta Jelutong	...	7.12½	6.35	
Nutmegs, No. 110's	...	37.00	35.00	
No. 80's	...	61.00	58.00	
Mace, Banda	...	87.00	78.00	
Amboyna	...	57.00	55.00	
Pepper, Black	658	29.00	28.00	
White (Sarawak)	537	39.12½	38.37½	
Pearl Sago, Small	10	4.87½	4.62½	
Medium	...	...	...	
Large	...	...	...	
Sago Flour, No. 1	2,865	3.25	3.02½	
No. 2	35	.90	.90	
Flake Tapioca, Small	466	7.25	5.65	Closing fair.
Medium	20	No quotation		
Pearl Tapioca, Small	238	6.00	5.05	
Medium	308	6.72½	5.30	
Bullet	35	7.25	6.25	
Tin	1,635	86.87½	82.87½	

Export Telegram to Europe and America.

Fortnight ending 15th August, 1905.

Wired at 4 P.M. on 16th August, 1905.

				Tons.
Tin	Str.	Singapore and Penang to	United Kingdom &/or	2,025
Do.	„	Do.	U. S. A.	860
Do.	„	Do.	Continent	290
Gambier	„	Singapore	Glasgow	...
Do.	„	Do.	London	...
Do.	„	Do.	Liverpool	100
Do.	„	Do.	U. K. &/or Continent	75
Cube Gambier	„	Do.	United Kingdom	55
Black Pepper	„	Do.	Do.	...
Do.	„	Penang	Do.	...
White Pepper	„	Singapore	Do.	55
Do.	„	Penang	Do.	...
Pearl Sago	„	Singapore	Do.	5
Sago Flour	„	Do.	London	160
Do.	„	Do.	Liverpool	900
Do.	„	Do.	Glasgow	75
Tapioca Flake	„	Singapore & Penang	United Kingdom	250
T. Pearl & Bullets	„	Do.	Do.	280
Tapioca Flour	„	Penang	Do.	280
Gutta Percha	„	Singapore	Do.	75
Buffalo Hides	„	Do.	Do.	70
Pineapples	„	Do.	Do.	cases 34,500
Gambier	„	Do.	U. S. A.	900
Cube Gambier	„	Do.	Do.	140
Black Pepper	„	Do.	Do.	500
Do.	„	Penang	Do.	310
White Pepper	„	Singapore	Do.	180
Do.	„	Penang	Do.	...
T. Flake & Pearl	„	Singapore & Penang	Do.	575
Nutmegs	„	Do.	Do.	71
Sago Flour	„	Singapore	Do.	450
Pineapples	„	Do.	Do.	cases 4,250
Do.	„	Do.	Continent	„ 1,000
Gambier	„	Do.	S. Continent	...
Do.	„	Do.	N. Continent	225
Cube Gambier	„	Do.	Continent	55
Black Pepper	„	Do.	S. Continent	35
Do.	„	Do.	N. Continent	50
Do.	„	Penang	S. Continent	...
Do.	„	Do.	N. Continent	...
White Pepper	„	Singapore	S. Continent	10
Do.	„	Do.	N. Continent	70
Do.	„	Penang	S. Continent	...
Do.	„	Do.	N. Continent	...
Copra	„	Singapore & Penang	Marseilles	560
Do.	„	Do.	Odessa	...
Do.	„	Do.	Other South Continent	200
Do.	„	Do.	N. Continent	3,420
Sago Flour	„	Do.	Continent	950
Tapioca Flake	„	Singapore & Penang	Do.	45
Do. Pearl	„	Do.	Do.	420

				Tons.
Copra	Str.	Singapore	England	100
Gambier	Slr.	Do.	U. S. A.	...
Cube Gambier	,,	Do.	Do.	...
T. Flake and Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	...
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	...
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	...
Pineapples	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...

600 tons Gambier }
375 ,, Black Pepper } Contracts.

Export Telegram to Europe and America.

Fortnight ending 31st August, 1905.

Wired at 3.15 P.M. on 1st September, 1905.

				Tons.
Tin	Str.	Singapore & Penang to	United Kingdom &/or	1,311
Do.	,,	Do.	U. S. A.	740
Do.	,,	Do.	Continent	526
Gambier	,,	Singapore	Glasgow	...
Do.	,,	Do.	London	...
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	U. K. &/or Continent	175
Cube Gambier	,,	Do.	United Kingdom	25
Black Pepper	,,	Do.	Do.	70
Do.	,,	Penang	Do.	...
White Pepper	,,	Singapore	Do.	90
Do.	,,	Penang	Do.	...
Pearl Sago	,,	Singapore	Do.	...
Sago Flour	,,	Do.	London	175
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	Glasgow	...
Tapioca Flake	,,	Singapore & Penang	United Kingdom	240
T. Pearl & Bullets	,,	Do.	Do.	175
Tapioca Flour	,,	Penang	Do.	575
Gutta Percha	,,	Singapore	Do.	35
Buffalo Hides	,,	Do.	Do.	40
Pineapples	,,	Do.	Do.	cases 5,250
Gambier	,,	Do.	U. S. A.	775
Cube Gambier	,,	Do.	Do.	65
Black Pepper	,,	Do.	Do.	600
Do.	,,	Penang	Do.	180
White Pepper	,,	Singapore	Do.	100
Do.	,	Penang	Do.	20
T. Flake & Pearl	,,	Singapore & Penang	Do.	550
Nutmegs	,,	Do.	Do.	25
Sago Flour	,,	Singapore	Do.	210

				Tons.
Pineapples	Str.	Singapore	To U. S. A.	cases 4,250
Do.	,,	Do.	Continent	,, 1,250
Gambier	,,	Do.	S. Continent	50
Do.	,,	Do.	N. Continent	125
Cube Gambier	,,	Do.	Continent	75
Black Pepper	,,	Do.	S. Continent	140
Do.	,,	Do.	N. Continent	50
Do.	,,	Penang	S. Continent	30
Do.	,,	Do.	N. Continent	...
White Pepper	,,	Singapore	S. Continent	10
Do.	,,	Do.	N. Continent	260
Do.	,,	Penang	S. Continent	...
Do.	,,	Do.	N. Continent	10
Copra	,,	Singapore & Penang	Marseilles	1050
Do.	,,	Do.	Odessa	560
Do.	,,	Do.	Other S. Continent	760
Do.	,,	Do.	N. Continent	1,025
Sago Flour	,,	Singapore	Continent	430
Tapioca Flake	,,	Singapore & Penang	Do.	230
Do. Pearl	,,	Do.	Do.	160
Copra	,,	Singapore	England	...
Gambier	Slr.	Do.	U. S. A.	...
Cube Gambier	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	...
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	...
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	...
Pineapples	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...

1,700 tons Gambier }
550 ,, Black Pepper } Contracts.

Singapore.

Abstract of Meteorological Readings for the month of August, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·901	138·7	80·7	88·6	74·6	14·0	77·9	·895	76·0	80	S.E. S.W.bS	4·58	1·06

A. B. LEICESTER,
Meteorological Observer.

D. K. McDowell,
Principal Civil Medical Officer, S. S.

Kandang Kerbau Hospital Observatory,
Singapore, 19*th September*, 1905.

Penang.

Abstract of Meteorological Readings in the Prison Observatory for the month of August, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Mean Maximum.	Mean Minimum.	Mean Range.	Mean Wet Bulb.	Mean Vapour Tension.	Mean Dew Point.	Mean Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	°F	%		Ins.	Ins.
Criminal Prison Observatory	29·885	148·3	80·6	89·3	74·0	15·3	75·4	·781	70·45	70	S.	4·76	0·86

COLONIAL SURGEON'S OFFICE,
PENANG, *16th September*, 1905.

M. E. SCRIVEN,
Assistant Surgeon.

S. LUCY,
Acting Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for the month of August, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Durian Daun Hospital	29·816	153·8	83·1	88·3	74·5	13·9	80·1	990·	71·3	87	E.	11·09	2·29

COLONIAL SURGEON'S OFFICE,
MALACCA, 19*th September*, 1905.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of August, 1905.

DISTRICT.		Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
				Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping	...	...	153	83·06	94	71	23	77·39	864	...	77	...	8·31	1·99
Kuala Kangsar	...	...	...	81·06	93	71	22	75·78	822	...	77	...	6·36	1·80
Batu Gajah	...	...	159	81·57	95	71	24	77·52	890	...	83	...	9·05	3·20
Gopeng	...	...	...	80·90	94	68	26	75·74	823	...	78	...	5·61	1·36
Ipoh	...		...	80·75	96	73	23	76·55	859	...	82	...	5·03	1·14
Kampar	...	...	...	...	...	69	...	...	...	...	...	..	12·11	2·74
Teluk Anson	...	...	...	81·51	92	70	22	76·91	864	...	81	...	6·30	1·92
Tapah	...	...	...	80·79	92	69	23	75·90	832	...	80	...	12·54	2·96
Parit Buntar	...	...	...	82·66	93	72	21	77·10	857	...	77	...	3·44	1·47
Bagan Serai	...	...	...	82·15	93	70	23	76·95	857	...	78	...	4·90	1·78
Selama	...	...	...	82·18	91	70	21	77·13	865	...	79	...	10·36	3·31

STATE SURGEON'S OFFICE,
TAIPING, 12*th September*, 1905.

M. J. WRIGHT,
State Surgeon.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of August, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·886	150·1	79·4	89·4	70·0	19·4	76·0	0·833	73·7	83	Calm.	7·59	2·58
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	4·29	2·31
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	5·45	1·80
,, Klang	...	...	...	87·7	70·9	16·8	...	...	...	...	...	5·57	2·30
,, Kuala Langat	...	...	...	87·3	73·7	13·6	...	...	...	...	...	6·74	2·67
,, Kajang	...	...	...	89·9	71·7	18·2	...	...	...	...	...	6·80	1·34
,, Kuala Selangor	...	...	...	...	...	...	...	...	...	...	...	7·11	1·70
,, Kuala Kubu	...	...	...	91·6	71·9	19·7	...	...	...	...	...	12·38	5·37
,, Serendah	...	...	...	90·4	75·0	15·4	...	...	...	...	...	6·98	1·24
,, Rawang	...	...	...	88·9	70·4	18·4	...	...	...	...	...	6·84	1·24
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	8·87	3·23
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	...	2·45	0·90

State Surgeon's Office,

Kuala Lumpur, 18*th September*, 1905.

E. A. O. TRAVERS,

State Surgeon, Selangor.

Muar.

Abstract of Meteorological Readings for the month of August, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Lanadron Estate ...	...	...	81°	88°	71°	17°	74°	...	...	...	...	8·69	2·69

MUAR, 11*th September*, 1905.

ROGER PEARS.

The Duff Development Company, Limited, Kelantan.

Abstract of Meteorological Readings for the month of August, 1905.

DISTRICT.	Temperature.			Rainfall.	
	Maximum.	Minimum.	Range.	Total Rainfall.	Greatest Rainfall during 24 hours.
	Mean. °F	Mean. °F	Mean. °F	Inches.	Inches.
Kuala Lebir ...	89·0	70·6	18·3	5·86	1·41
Ulu Liang ...	88·0	70·8	17·1	12·36	2·01
Kuala Kelantan ...	86·5	73·3	13·2	3·48	·98

SURGEON'S OFFICE,
13th September, 1905.

JOHN D. GIMLETTE,
Surgeon.

METEOROLOGICAL OBSERVATIONS.

Table Showing the Daily Results of the Reading of Meteorological Observations taken at the General Hospital, Seremban, for the Month of July, 1905.

Date.	Temperature of radiation.						Temperature of radiation.				Wind. Direction.		Temperature of evaporation.			Computed vapour tension.			Relative humidity.			Clouds 0 to 10.			Cloud and weather direction.			Rain.
	9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Sun.	Difference sun and shade.	Grass.	Difference shade and radiation.	9 H	15 H	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	21 H	9 H	15 H	21 H	Inches.
	°	°	°	°	°	°	°	°	°	°			°	°	°	in.	in.	in.	°	°	°							
1	80	77	78·5	85	73	12	136	51	...	...	S.E.	S.E.	75·	73·6	74·3	0·867	0·829	0·848	85	89	87	0	10	10	B	R	R	·73
2	78	86	82	86	70	16	149	63	...	...	S.E.	S.E.	71·2	71·2	71·2	·765	·763	·764	79	61	70	0	0	0	B	B	B	
3	80	85	82·5	86	73	13	146	60	...	...	N.E.	S.E.	75·	73·4	74·2	·867	·826	·846	85	68	76·5	0	0	0	B	B	B	
4	79	85	82	87	73	14	149	62	...	...	S.E.	S.	75·6	71·8	73·7	·888	·781	·834	90	64	77	0	0	10	B	B	R	1.30
5	75	83	79	84	73	11	100	16	...	...	S.E.	S.E.	73·3	76·3	74·8	·820	·905	·862	94	80	87	3	3	3	C	C	C	
6	75	84	79·5	86	72	14	141	55	...	...	S.E.	S.	73·3	75·7	74·5	·820	·888	·854	94	76	85	3	5	10	C	C	R	1·42
7	76	84	80	84	71	13	140	56	...	...	E.	S.E.	74·3	72·4	73·3	·848	·794	·821	94	68	81	0	5	0	B	C	B	
8	76	87	81·5	88	73	15	146	60	...	...	S.E.	S.E.	74·3	77·1	75·7	·848	·933	·890	94	73	83·5	0	3	3	B	C	C	
9	76	84	80	86	74	12	155	69	...	...	S.E.	S.E.	75·	75·7	75·3	·867	·888	·877	85	76	80·5	3	0	0	C	B	B	
10	80	82	81	87	73	14	154	67	...	...	S.E.	S.E.	72·9	75·3	74·1	·810	·877	·843	84	80	82	0	0	0	B	B	B	·03
11	76	87	81·5	87	74	13	153	66	...	...	S.E.	N.E.	72·6	72·2	72·4	·801	·792	·796	89	61	75	3	0	0	C	B	B	
12	77	88	82·5	89	72	17	156	67	...	...	S.E.	S.E.	71·9	71·6	71·7	·783	·775	·779	84	58	71	0	3	0	B	C	B	
13	81	86	83·5	87	72	15	153	66	...	...	S.E.	S.	74·2	71·2	72·7	·849	·763	·806	80	61	70·5	3	0	0	C	B	B	
14	76	79	77·5	80	73	7	101	21	...	...	S.E.	E.	72·6	75·6	74·1	·801	·888	·844	89	90	89·5	10	3	2	R	C	B	1·62
15	76	81	76	82	71	11	127	45	...	...	S.E.	S.E.	74·3	76·2	75·2	·848	·897	·872	94	85	89·5	10	3	0	R	C	B	
16	77	82	79·5	84	71	13	150	66	...	...	S.E.	S.E.	73·6	75·3	74·4	·829	·877	·853	89	80	84·5	10	3	5	R	C	C	.80
17	75	84	79·5	84	73	11	136	52	...	...	S.W.	S.W.	73·3	74·	73·6	·820	·840	·830	94	72	83	3	3	2	C	C	B	
18	80	81	80·5	86	72	14	137	51	...	...	S.E.	S.E.	75·	74·2	74·6	·867	·849	·858	85	80	82·5	2	2	5	B	B	C	·31
19	76	77	76·5	84	71	13	100	16	...	...	S.E.	S.E.	72·6	73.6	73·1	·801	·829	·815	89	89	89	10	5	10	R	C	R	·39
20	75	84	79·5	84	72	12	103	19	...	...	S.E,	S.E.	73·3	74.	73·6	·820	·840	·830	94	72	83	3	5	10	C	C	R	1·10
21	77	83	80	84	71	13	137	53	...	...	N.E.	S.	73·6	71·3	72·4	·829	·766	·797	89	68	78·5	3	0	3	C	B	C	
22	79	83	81	84	73	11	114	30	...	...	S.E.	S.	73·9	73·	73·4	·839	·810	·824	85	72	78·5	3	3	5	C	C	C	·21
23	79	83	81	83	74	9	144	61	...	...	S.	S.	75·6	73·	74·3	·888	·810	·849	90	72	81	3	3	5	C	C	C	1·42
24	80	84	82	86	72	14	151	65	...	...	S.E.	S.	76·6	74·	75·3	·916	·840	·878	90	72	81	3	3	3	C	C	C	
25	80	85	82·5	86	74	12	120	34	...	...	S.E.	S.E.	73·3	73·4	73·3	·820	·826	·823	80	68	74	3	2	2	C	B	B	
26	75	82	78·5	84	72	12	147	63	...	...	S.E.	S.E.	73·3	72·	72·6	·820	·785	·802	94	72	83	5	3	2	C	C	B	
27	80	85	82·5	87	73	14	150	63	...	...	S.E.	S.E.	71·6	66·8	69·2	·775	·660	·717	75	55	65	2	0	0	B	B	B	
28	78	83	80·5	85	73	12	140	55	...	...	S.E.	S.E.	72·9	74·7	73·8	·810	·856	·833	94	76	80	3	3	3	C	C	C	·23
29	79	85	82	86	72	14	147	61	...	...	S.E.	S.	73·9	70·1	72·	·839	.738	.788	85	61	73	3	0	2	C	B	B	·05
30	78	85	81·5	87	72	15	145	58	...	...	S.E.	S.E.	72·9	74·7	73·8	.810	856	·833	84	76	80	0	0	2	B	B	B	
31	78	79	78·5	86	72	14	149	63	...	...	S.E,	S.E.	72·9	75·6	74·2	·810	.888	.849	84	90	87	5	0	0	C	B	B	

Total 9·61

State Surgeon's Office,
Seremban, 12*th August*, 1905.

R. VAN GEYZEL,
Apothecary.

No. 10.] OCTOBER, 1905. [VOL. IV.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY
H. N. RIDLEY, M. A., F. L. S.,
Director of Botanic Gardens, S. S.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.

AGRICULTURAL BULLETIN
OF THE
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No. 10.] OCTOBER, 1905. [VOL. IV.

THE POSITION OF RUBBER AMONG CULTIVATED PLANTS.

There are a number of people who from time to time write to various papers to express their fears that Rubber cultivation will soon be overdone and that a terrible collapse must ensue. They usually cite as a precedent the collapse of Cinchona cultivation, to argue from which displays a vast depth of ignorance as to the different values of cultivations to the planter.

The various cultivations of useful products can be more or less classified into groups, a study of which will show the peculiar advantages of the cultivation of rubber, and the foolishness of comparing it with those of Cinchona. Economic products can be classed into those of everyday use, and those of special use. Products of everyday use are those that are used by everyone or almost everyone, everyday, essentials for the existence of modern civilization such are Tea, Coffee, Wheat, Rubber. Products of special use are those that are seldom used on a large scale, but for which there is a greater or smaller demand, such are Indigo, Gambier, Pepper, Vanilla and Drugs.

The next most important point in the classification of products to look at is the area on the world's surface on which can produce the supply. In the case of plants of special use it is essential that the productive area should be limited. There are many useful plants such for instance as Coca, Croton oil, Arnotto, of which the area in which they can be grown is so large that the supply is practically unlimited while the demand is small, such plants can only prove remunerative when owing to an overstock, planters have abandoned them and there suddenly occurs a temporary but often good demand.

Plants of special or limited use whose area whether circumscribed by climate, soil or surroundings is also limited are often very valuable sources of remuneration. Often quite simple accidents will limit the area of a plant. Thus Vanilla a crop of considerable value with a limited source of supply, is not successfully grown here because although the growth of the plant is rapid and easy, it flowers regularly and well, and appears to have no enemies, it fails from the fact that the slowly ripening fruit requires nearly four months dry weather in order to mature. If during this period a heavy spell of rain falls, the young fruits perish, and as the plant flowers at a period just preceding the wetter months here, the fruit crop usually fails.

An ideal plant for the planter is one belonging to the class of those in constant everyday use, which can only be grown in a limited area. Now if the areas of successful cultivation of this class of crop be as carefully studied as we have data for, we shall see a great difference in the values of the cultivations as studied from this point of view.

I may say, it is not very easy to judge accurately the amount of suitable area for any given cultivation even approximately, in spite of all reports and agricultural publications published all over the world. There is a great tendency to exaggerate the area which can be used. Some one for instance, reports surprising growth of a rubber tree or trees in some region and prophesies a great future for the cultivation. A few years go by and one hears no more. Enquiries show that the opinion was based on a few trees in very special almost horticultural circumstances, and that the area is utterly unsuitable for the plant.

As far as tropical cultivations are concerned we may take approximately 20 degrees North and 20 South of the line in which we can grow tropical plants with anything approaching success. This area includes the Northern part of Australia, the Malay Peninsula and Islands, Cochin-China, India south of Calcutta, a large area of Africa, and America from Mexico and the West Indies to Rio de Janeiro and a considerable number of Polynesian Islands. Now taking our chief tropical crops of the first class, we see that Coffee can be grown over almost every portion of this area excluding perhaps the desert portions of Australia, Africa and a small area in South America.

Tea again has been successfully grown, over the greater part of the same area and further North in some parts of Asia. That it has not been grown in South America is due to the required supply being produced in Asia, and from the fact that it has never had any market to speak of in South America. To a certain extent these two products supplement each other, and when one is used the other is not.

Sugar again is one of the plants of which though the demand is very large the area of cultivation is of very large dimensions, extending not only over most of the tropical regions but also over an extensive temperate region.

It cannot be wondered at then that these products can be easily overstocked.

Rubber is however in a different position. It is exclusively a tropical product, no rubber plant of any value having been met with outside the tropic area as above defined or having been successfully grown outside.

There are four kinds of rubber trees which are practically the only ones of value for cultivation purposes, for though there are a number of other plants which produce a rubber of more or less value, the difficulty of growing them in the case of the rubber vines, for practical purposes, and the slowness of growth, and inferiority of product in the others exclude them from consideration. These four kinds are Para rubber, Rambong, Castilloa and Ceara rubber, of these the first two require a continuous rainfall, and can best be grown in the low country, Castilloa is more suited for hill regions, and Ceara, is a desert plant preferring sandy regions.

Para rubber seems to dislike a long spell of dry season, and if in such places it grows its growth is slow. It is also an inhabitant of alluvial plains requiring a fairly good soil.

Taking the same area as before we may exclude as a possible producing area all Australia except possibly a small part of the extreme north, Cochin-China, and India, except perhaps parts of Burmah the whole of Africa (except perhaps a small part of the West coast), a region too dry and open for Para rubber and probably Rambong also ; and a very large area of South America.

The Eastern region of Brazil, Rio Grande del Norte, Pernambuco, and Bahia are dry campos covered with an open forest, and from what I have seen of them quite unsuited for the better class rubbers. The only wild rubbers in this region are the Mangabeira and Ceara, and it is highly improbable that either of these will interfere with rubber cultivation at all. In the more western parts of Brazil, Bolivia, Peru, the Amazonas district of Brazil, and as far north as Mexico the rubbers Hevea, Castilloa and probably Rambong could be and are being well grown. Some of the Polynesian islands may prove sources of rubber supply in the future, but in only the larger islands will it be possible to grow the plant successfully, owing to the maritime nature of the greater part of the islands and it is on the whole not probable that the entire Polynesian area will ever produce any important supply of rubber.

Meanwhile rubber is a product of universal use, a necessity of modern civilization, becoming more and more important every day, and being used directly or indirectly by everyone every day. Hitherto it has been only a jungle product, very little having been produced under cultivation. The area in which it has been produced is almost exhausted of the product, and a large part of that area, (the greater part of Africa) is utterly unsuited for the cultivation of any rubber plant of any value. The Landolphias of Africa are quite unsuited for cultivation, and are never likely to come into competition with the cultivated Heveas and Ficus. *Funtumia*, again does not seem according to the latest reports on its growth and return likely to be of great importance in the future. Over the large area which produced these rubbers and which is now nearly exhausted of its stock, there is little or no ground suited for the cultivation of those rubbers which are possible to cultivate remuneratively. The volume of rubber produced by this area must therefore be supplied by the increasing area of cultivation in the Malay Peninsula, Ceylon and a few other parts of the world.

Mexico and Northern Brazil may perhaps be able to supply Castilloa and Hevea rubber in sufficient amount to replace the denuded forests of the Amazons. But in the meantime the demand is increasing and it will be long before the product can possibly be produced in sufficient quantity to fill even the present demand. Rubber then is almost the ideal cultivation for the planter. It is a product of universal, everyday use, and its area of production is distinctly a limited one. It is absurd to compare it with coffee a product of universal use but with an enormous producing area, practically the whole of the tropics, or Cinchona a plant of more limited area but very limited use. Both of these it is obvious could easily be overproduced, as indeed is the case of most of the other tropical products. Rubber in fact is the only product known to me which while it has an universal use has so limited an area of production and it is also unique in having practically disappeared from a large area which supplied a considerable portion of the world's supply, and in which it can never be replaced. Under these exceptional circumstances it does not seem probable that this product is likely to be overproduced for very many years if it ever is at all.—*Editor*.

RUBBER DISEASES: LATEST MYCOLOGICAL NOTES.

RESULT OF INJURIES TO THE CAMBIUM, ETC.

Mr. T. PETCH, the mycologist of Peradeniya, has the following article in the September issue of the Magazine of the Agricultura Society :—

In Mr. RICHARD HOFFMAN'S final article on rubber cultivation, in the *Financial News*, he discusses briefly the possibility of fungoid disease and dismisses the subject with the remark that it is " very improbable, for the tree, being deciduous (*viz.*, shedding its leaves annually), is not likely to contract a permanent leaf disease."

It is hoped that no planter will be led by this statement to neglect any suspicious appearance on the ground that the leaves only are affected. It is quite true that though many leaf fungi have been found on Hevea none of these at present cause serious injury. The Pestalozzia recorded in the June number of the *Tropical Agriculturist* occurred in a nursery bounded on one side by tea, and the only plants attached were on that side. They were then about a foot high. Practically all the diseased leaves were gathered, and, when I visited the nursery later to obtain fresh specimens, I found that the plants, then three feet high, were quite free from any disease. There is no doubt that the young plants had been infested by spores blown from the adjacent tea bushes.

Helminthosporium attacks rather older plants, but is again apparently confined to nurseries: it has been sent in from several localities.

So far the trees are free from leaf disease, but it is not true that the periodical leaf fall confers any immunity. Deciduous trees can and do suffer serious injury; in fact, the injury inflicted on them is greater than on other species, since they are generally deprived of their foliage at a time when all their reserve food has been consumed in the formation of new leaves which have not yet elaborated a further supply.

Mr. HOFFMAN'S comparison with an English apple orchard is rather unfortunate, as the majority are hotbeds of disease, and in the remainder a paying crop can only be realised by constantly spraying against the attacks of fungi and insects.

Many specimens are sent for examination which, though in a sense pathological, are not mycological. Two recent cases are of considerable interest, showing that the power of forming new bark which Hevea possesses to such an extraordinary degree sometimes produces.

RESULTS WHICH ARE NOT ALTOGETHER DESIRABLE.

The first series of specimens consisted of several "knots" of wood measuring from one centimetre diameter to 9 × 7 × 5 cms. These were cut from the trunks of trees, 10 or 12 years old, averaging 4 to 5 feet in girth at three feet from the ground. In some cases the growths cover the first five feet of the trunk. The trees appear to be knobby and buttressed on the stem where affected by this growth, and, on an incision being made, the bark is found to be very thick and of a claret colour, and does not yield latex. Covered by the thick growth of bark are the hard growths of wood previously mentioned; these are not attached to the main stem but "shell out" quite easily when the outer bark has been cut away. Between the knots and the main stem is a second layer of bark and often a layer of rotten latex. The trees have been tapped on the V system at some unknown date, and the knots occur on the old tapped surface.

The structure of these "knots" is identical with that of the "Masers knollen" of beech and other trees. They are formed in the bark by an adventitious cambium which has no connection with the main cambium of the stem. In the case of large growths, the latex probably passes down the inner layer of bark, while the outer bark dries up and thus acquires a dull claret colour. The layer of latex between the bark and the main trunk may be due to an internal rupture resulting from the tensions induced by unequal growth. Similar growths occur normally in Beech trees, as a result of wounds in apple and pear, from insect attacks in oak, and from fungus attacks in eucalyptus. In Hevea, they are the result of excessive irritation caused by careless tapping. It has been suggested that the insertion of the cup at the base of the V is responsible for this irritation, but the position of the knobs negatives the idea.

In a second instance the specimens submitted consisted of lengths of the stem of Hevea, 3 to 4 years old, and about 4 inches in diameter, grown at an elevation of 2,500 feet. The normally smooth bark was interrupted by gnarled patches, circular or irregularly shaped, varying from one-half to three inches in diameter, with a margin formed by the slightly upturned edge of the normal bark. The smaller patches resemble branch scars, but their number, as many as thirty-six on a length of one foot, showed that this was not correct. On removing the bark, the wood immediately beneath was found to be swollen and sometimes raised in small lumps and thorns, but there was no sign of any fungus. After chiselling out the sound wood to a depth of half an inch, thin black patches, about an inch in diameter, were disclosed, and a microscopic examination showed that these consisted of dead elements of wood and bark thus forming a separation layer between the wood on either face. It is evident that these patches represent injuries incurred by the tree some nine months previously which have been overgrown by a new layer of wood and bark. The important point, however, is that the extra effort required to accomplish this has not ceased when the gap was closed, but has continued to produce more than the normal quantity of material, thus making the wood at that point half as thick again as the wood produced in the same time in places where the stem has not been injured. The pressure exerted by this additional material enlarges the external "canker" and prevents the formation of a smooth bark.

Bark attacked by the true Hevea canker is, as a rule, unbroken or only slightly cracked, dark on the exterior, a dirty claret colour internally, friable, and full of moisture. Gnarled bark is usually merely the expression of extreme irritability.

In the case of "knots" forming knobs on the trunk, it may be possible to secure a smoother surface by cutting them out together with their enveloping cabium, but care must be taken not to remove the inner bark, and the operation should be performed when the knots are small. No method of treatment will remove the cause of the irritation in the second case referred to; this roughness, however, will not be such an obstacle to tapping as the large swellings produced by the "knots."

Since injuries inflicted on young trees influence the growth of their bark for many years, it is important that all unnecessary wounding should be avoided. Coolies frequently tap young trees with a sharp stone in order to see the milk flow, forming irregular wounds which are quite sufficient to account for the appearances described.

"Times of Ceylon."

22-9-05.

RUBBER IN AFRICA.

Mr. Johnson, the Director of Agriculture on the Gold Coast publishes a short, but interesting account of recent doings in Rubber planting in the Gold Coast. Here Para rubber seems to do well, ten year old trees giving an average of 1 lb. ¾ oz. rubber per tree, and the rubber is reported to be as good as that received from Ceylon. The tree is a quicker grower than *Funtumia* and is quite free from insect attacks "On the other hand" he says "that Hevea is an exotic and *Funtumia* a native" but in spite of this he considers there is every reason to anticipate that Hevea would be as successful as other exotics like tea, coffee, etc., introduced into that country. We merely quote this as there are a number of people who think that because a plant is not indigenous to the Country it is less likely to do well than an indigenous plant under cultivation. The reverse is as a matter of fact the case. If an exotic plant can get into a country in which the climate and soil suit it, it has great advantages over indigenous plants. In the first place change of locality seems always to benefit a plant, for what exact reason is not clear, but the fact is well known to horticulturists. In the second place, it is free from the insect and fungus pests which attack a plant in its own home, while there are in its new home no insects or fungi which at first at least can manage to feed on it. In time a fungus or insect may adapt its habits of life so as to attack the newcomer, and probably does so. A closely allied plant may exist in the locality where the newcomer arrives and its enemies may be able to attack at once, just as the Coffee beehawk moth whose caterpillar feeds normally on Gardenia bushes, soon transferred its attention to the allied Coffee bushes. But assuming that climate suits an exotic it has a better chance of escaping attacks by far than an indigenous plant which has its enemies all ready on the ground. Hevea has not any very near relations at Asia or Africa, hence its comparative immunity from pests in present.

To revert to Mr. Johnson's report he does not speak highly of *Funtumia*. It is attacked by a caterpillar of the pestilential genus *Glyphodes* (some of which here attack the Rambong) and also by the fungus (*Meliola*). Its growth is slow and it cannot be safely tapped before 9 years, one tapped at 7 years' age gave 4 oz. rubber, but the shock of too heavy tapping nearly killed it. Two more tapped more carefully at 9 years' old gave one and two ounces respectively. While Para rubber a year older gave 1lb. ¾oz. The rubber obtained contained 8.67 p.c. resin, and 89.33 caoutchouc as against 3.25–3 90 resin and 95.96–95.53 p.c. caoutchouc in Para.

Under these circumstances *Funtumia* is hardly likely again to play an important part in the world's rubber supply.

Mr. JOHNSON points out in conclusion that rubber plants are not nearly so plentiful in Africa as was generally supposed, and gives a table showing the enormous decrease in rubber export from West Africa from 1898 to 1902, *viz.*, from 94·301 cwts. in 1898 to 18·486 in 1902.—*Editor.*

RUBBER SOILS.

A circular issued by the Royal Botanic Gardens, Ceylon, July, 1905, deals with Para Rubber, chiefly from a chemical point of view. A series of analyses of soils and of fresh and decaying leaves, twigs, etc., being given. The article is by Messrs. WRIGHT and BRUCE, and is interesting and instructive. The authors point out that the drain on the soil by taking away the latex is not great but that though the loss is small yet it should be taken into consideration after a number of years and an attempt made to replace the mineral matter and nitrogen. Though this may be admitted it forms a very trivial loss of food-material compared with the losses of sweeping away the leaves and twigs and removing the weeds which have grown beneath. Indeed the loss by the removal of the seeds would probably be far greater than that caused by the removal of the latex.

The authors further say, "We are at present of the opinion that manuring at the young stage would help on the young plants and prove to be beneficial." This cautious opinion was justified as long ago as November, 1903, in the Bulletin with an illustrative photograph, (published later). It seems a pity that the authors do not keep au courant with rubber literature.

They continue "We would strongly recommend that the fallen leaves be buried with lime or basic slag in trenches or round the trees at a distance of from 4 to 6 feet from the trunk." I should venture to dissuade planters in the Malay Peninsula at least from doing anything of the kind. In the paper above referred lime was shown to be, if used in quantity at least, injurious to the tree. But more serious is the damage that would be caused by cutting through the roots of the tree at a distance of from four to six feet from the trunk. Para rubber in the Peninsula roots very high, and such treatment would be most injurious not only checking the growth of the roots, but allowing a possibility of their injury on the cut ends by inroads of fungi. By all means let the leaves and small twigs rot on the ground and feed the plant, as is done in the

Botanic Gardens in Singapore but the greatest care should be taken not to injure the roots by cutting or bruising them under any circumstances. As the authors remark they do not advance any opinion as to the effects of manuring old trees, as indeed no experiments have yet been made as far as records go in Ceylon on this subject. Experiments have been made however in Singapore and we hope to publish the results shortly. As far as growth of trees is concerned liberal manuring with cowdung has not shown any improvement. The increase, if any, in latex on the manured trees has not yet been worked out. Perhaps the most instructive part of the whole paper lies in the chemistry of the decaying leaves and twigs where the authors show that in sweeping off the ground 10,000 lbs. of fallen leaves and twigs (about 75 piculs) about 58 lbs. lime, 36 lbs. magnesia, 22 lbs. potash and 12 lbs. phosphoric acid are removed right away from the ground. Of course in a nice clean kept estate with the ground absolutely bare more plant food will be washed away by the rain from the surface, so that in time the plants would be starved and the soil rendered absolutely sterile and useless.—*Editor.*

PLANTATION RUBBER ON THE EUROPEAN CONTINENT.

"Times of Ceylon,"

22nd September, 1905.

September 19th, 1905, will be an historic day in the Antwerp rubber trade, for on Tuesday last the first consignments of Malaya and Ceylon rubber appeared in the regular catalogue, and were publicly sold at prices which were doubtless the talk of the trade in this important and growing continental centre. Considering the occasion an interesting one, we cabled to the largest rubber brokers in Antwerp for the results; and, although one word is indecipherable and is not altered on repetition, we believe we have put the right interpretation on it. Knowing that we had the catalogue, the Antwerp firm has told us that the sale was very good, and, as it is very rare for rubber there to be sold at less than its valuation, we take it that the prices average out at 33 centimes *more*, (which is the indecipherable word) instead of less, for the new article. We extract from the middle of page 7 of a closely-printed catalogue the six entries, just as they appear in the original:—

Par St. Fos.

Nos.	Taxes. f. c.	Quantities:	
2745	17·40	env. 296 kil.	Straits Biscuits, minces et en major, clairs, agglomérés par séries, de belle qualité, en partie un peu moisis entre les biscuits, (dont env. 12 k. marchandise ancienne, pressée et un peu poiss.)
2746	15·00	,, 12 ,,	Rambong Biscuits, marchandise nerv., un peu charg. d'écorces.
2747	13·00	,, 13 ,,	Straits Scrap, déchets, pp. clairs, un peu charg. d'impuretés, mais de belle qualité.

PAR ST. VALERIA.

2748	17·20	env. 111 kil.	CEYLON, BISCUITS (YATADERIYA), ass. épais, en partie de forme carrée, en major. clairs, de belle qualité, partiell. un peu blanchâtres intér.
2749	17·30	„ 122 „	CEYLON BISCUITS, env. 47 k. (Gikiyanakanda), pp. clairs, minces, de belle qualité, (dont env. 6 k. plus foncés), env. 75 k. (Rayigam) id., mais un peu plus foncés.
2750	17·00	„ 73 „	CEYLON, BISCUITS (GALBODA), très clairs, mais non-transparents.

A kilogramme is equal to $2\frac{1}{5}$ lbs.; and consequently the valuations ("*taxes*") for plantation Hevea rubber work out at over 7s. per lb. There are no other quotations in the catalogue within four francs of the Ceylon prices; the general valuations would average 10 francs per kilogramme. And the rubber from the East fetched—as we interpret our special telegram—33 centimes per kilogramme, or about $1\frac{1}{4}$d. per lb. more than the above valuations.

Out of small events great ones grow; and as Antwerp is such a central point, as any one can see who consults a map of Europe, it should be the largest Continental rubber market—except, possibly, Bordeaux—when Ceylon and the Malay States are supplying an important proportion of the world's demands. As our supply grows it will be both impossible and undesirable to send nine-tenths of our output to London; and direct trading is to be one of the chief features of future commerce.

On the Introduction of Para Rubber to the Straits.

In the Tropical Agriculturist of September, the Editor continues his account of the history of Rubber Cultivation in Ceylon. With respect to the history of the relations between the Straits and Ceylon, he writes—

"In 1877 rooted cuttings were sent to the Straits to Mr. LOW for the Experimental Garden at Perak. As previously stated the plants produced flowers and fruits before the parent trees in Ceylon and in 1882 a consignment of seed was received from Mr. LOW but they were found to be dead on arrival. In 1886, nearly one-third and in 1888 more than half the total crop of seeds were sent to Singapore and other parts of the Straits. Seeds were subsequently sent but it is probably correct to assume that much of the rubber now in the Straits has been obtained from the original cuttings sent in 1877. It should be mentioned, however, that in 1876 plants were sent direct from Kew to Singapore."

The history of the introduction of Hevea into the Straits Settlements and Perak has been already described in the Bulletin and it is not quite the same as that of the Editor of the Tropical Agriculturist. It is pretty clear that the first Para rubber trees planted in Perak were those taken by MURTON from the Botanic Gardens, Singapore, and were some of the plants originally sent from Kew.

From LOW'S letters in 1877 and 1878, one gathers that these plants were the only ones he possessed then, and the Ceylon cuttings are not even alluded to. It is probable therefore that they failed. The seeds sent in 1882, were, without doubt, those of the Singapore garden trees. Some of the original trees in the Singapore gardens sent from Kew still exist, and from them were derived a large part of the younger trees which have supplied so many seeds to the Malay Peninsula. In 1888, 11,000 seeds were obtained from Ceylon, sent loose in gunny bags, and a large proportion germinated. But by that year rubber seeds had been distributed over the Peninsula largely from the original trees and their descendants; so that as explained previously, the greater part of the Para rubber trees in the Malay Peninsula were derived from the plants sent to the Botanic Gardens, Singapore, from Kew. However, it must be admitted that the seeds sent from Ceylon in 1888 have been very useful in helping to stock the Peninsula and other parts of the world lately.—*Editor.*

RUBBER NOTES.

In the India rubber world of September 1st, 1905, the Editor reproduces the photograph of the old tapping scar left on a Para rubber tree figured in Bulletin.

He remarks that while it was tapped with all reasonable care the bark was penetrated even to the wood. "It will be seen that though several inches of woody growth formed over the tapped surface the scar still remained in the interior of the tree. The illustration is an especially interesting one and should carry a warning to planters against careless tapping." Curiously we came to quite an opposite opinion on the same specimen. The tapping was very rough, the central cut being much too broad. The striking thing was that though the wounds were very large and deep and a big area of wood denuded of cambium and exposed to the air there is no trace of any decay, or real injury to the tree. A little black coloration about a millimetre thick is all the trace of any injury. The specimen seems to show that a Para rubber tree will stand a great amount of loss of cambium without any injurious effect.

I may say that of the trees tapped through the cambium in the Botanic Gardens, over 1,300 and many of them several times, only one tree has ever been injured even by the roughest tapping, and that was more of an accident than anything else.—*Editor.*

Caterpillar attacking Tobacco Plants.

Tobacco plants cultivated for commercial purposes or as ornamental plants, are very liable to the attacks of Caterpillars, one of these identified as that of *Chloridea assulta* Green, by Sir GEORGE HAMPSON, was found spoiling tobacco plants and also tomatos grown in the Botanic Gardens in August, 1902. It was light green with a paler band along the spiracles, quite smooth and hairless, and when disturbed coiled itself in a ring. It was adult and pupated in a few days, the moth hatching out on September 1st. It was a noctuid moth one inch across the wings, with filiform antennæ, of a pinkish fawn colour all over. the upper wings marked with wavy darker lines and a double darker one towards the tip. The underwings pale buff-yellow with a dusky curved band passing into a pale reddish colour, towards the fringed edge. The underside of the upper wings bore a black spot, and a transverse reddish band continuous with a similar band on the underwings. The body was buff coloured and fluffy.

This moth is described as widely spread over Africa and Asia, in the British Museum Catalogue of moths, where the Caterpillar is said to feed on *Physalis peruviana.*

H. N. R.

FEDERATED MALAY STATES RUBBER.

Important Notification.

Straits Times, October 4th, 1905.

Mr. W. W. Bailey, Chairman of the United Planters' Association, has forwarded to the "Malay Mail" for publication the following important letter on rubber which he has received from Messrs. Barlow & Co., Singapore:—

We have now received confirmation of the sale of the 90 cases per s.s. *Palermo.* The particulars are:—

			s. d.
70 cases Crepe sold at	...	...	7/4
5 „ Sheets „ „	...	...	6/4¼
15 „ „ „ „	...	...	6/4

Our London House referring to this shipment say:—"The Oblong Sheets show particularly good quality and the parcel of Crepe is fully up to the standard. The Sheets are more economical for the estate, supposing that there is no extra expense in manufacturing in this style, as in the same size case you are able to put 90 lbs. as against 55 lbs. of the Crepe. As the draft is calculated on the weight of the empty case no further allowance will have to be made on the heavier packages. There is of course also greater economy in the freight, as well as in the cost of cases. A more satisfactory result still could be obtained if you reverted to the larger packages. It is satisfactory to know that a very large number of buyers come into our broker's sale-room as the catalogues are issued. We met several there the other afternoon; but we are sorry to say that two or three to whom we spoke expressed themselves very strongly that the price of Ceylon and Straits Rubber would have to come down much nearer to that of fine Para, as the more extended use to which the newer grown Rubber has now been put convinces manufacturers that it is not as strong as the Brazilian kind. We have seen several of the buyers since the sale, and from what they tell us it is pretty evident that the larger number of them consider the sheets a much better form than the Crepe. There is always a very great suspicion in the minds of buyers that in the Crepe the scrap is mixed up with it; but they say that in manufacturing the Rubber into the form of sheets this could not be done, and in this we believe they are right. We would strongly recommend you to bring this to the notice of the Estate owners, and advise them to adopt the manufacture in sheet form in preference to any other. Some of these buyers tell us that they are quite satisfied with the produce of the Straits and Ceylon as far as it has gone, but they agree with what we have previously written to you, that this kind of Rubber is not as strong as Para. This is attributed to the fact that the trees from which a good deal of Straits and Ceylon Rubber is produced are immature, or comparatively so; and that, as the trees get older, the sap will not only be abundant, but will make Rubber of greater strength.

DAMAGE TO RUBBER PLANTS BY PORCUPINES.

FOREST OFFICE,
TAIPING, 3*rd October*, 1905.

DEAR SIR,—On a small Para Rubber plantation here, a considerable amount of damage has been done lately by porcupines. I should be very glad to know whether other plantations have suffered from the same cause, and what remedies have been adopted with success.

The porcupine gnaws the bark of the trees round the base, in some case completely ringing it; the wound usually reaches the wood, and consequently, when healed, leave a rough and scarred surface, which will seriously interfere with tapping.

The animals are not satisfied with any trees which they happen to light upon; they generally take a snack from several trees before settling down to a meal. They feed only at night, and do not come out when the moon is bright.

I have lately made nurseries which have also been vigorously attacked. The seed is allowed to sprout, and the porcupine roots up the plant when it is about nine inches high, and eats the seed. Nurseries however can be easily protected.

While the trees only were attacked I failed to find any way of dealing with the destroyers, in spite of traps and snares.

Now that the nursery attracts them all to one spot, I find that they can be easily taken in pitfalls. The pit should be made in the paths round the seed beds; these should be at least five feet deep, and three feet across the mouth; the pit should be wider at the bottom than at the top, to prevent climbing: two or three pieces of thin split bamboo, some lalang spread cunningly over and around the pit, and a piece of jack fruit as bait, will probably do all that is wanted.

I have caught three in four nights in this way, which is satisfactory as far as it goes; but it is evident that very considerable damage might be caused to an estate, before they could be exterminated, even if extermination were possible.

I beg to remain,
Dear Sir,
Yours faithfully,
W. H. BARNARD.
Acting Deputy Conservator of Forests,
Perak.

The Editor, Agricultural Bulletin,
Singapore.

IMPERIAL INSTITUTE.

(SOUTH KENSINGTON, LONDON, S. W.)

REPORT ON FOUR SAMPLES OF BAT GUANO FROM THE FEDERATED MALAY STATES.

BY

PROFESSOR WYNDHAM R. DUNSTAN, M.A., F.R.S., *Director.*

The first of these samples of bat guano was forwarded to the Imperial Institute by the Superintendent of the Botanical Gardens, Singapore, and is referred to in a letter dated the 18th March, 1904, which states that it was obtained from the limestone caves at Padang Rengas in Perak, about 16 miles from Taiping.

Subsequently three more samples of bat guano were sent to the Imperial Institute by the Superintendent of the Experimental Plantations of the Federated Malay States. These were described in a letter No. Ex. Pltns. 115/04, dated the 25th October, 1904, in which it was stated that they were collected in the Batu Caves at Selangor, Federated Malay States, which occur in limestone rock at a height of about 300 feet above sea level, and, so far as is known, are frequented by bats but not by any other species of mammals or birds.

It was desired that these samples of guano might be analysed and their commercial values determined.

DESCRIPTION OF SAMPLES.

SAMPLE A, from limestone caves at Padang Rengas, sent by the Superintendent of the Botanical Gardens, Singapore.

This sample weighed about 14 pounds, and consisted of small lumps mixed with powder. The colour was dark buff, but small white fragments of calcium sulphate and phosphate were visible here and there throughout the mass. The material had no characteristic odour.

SAMPLES SENT BY SUPERINTENDENT, EXPERIMENTAL PLANTATIONS, F.M.S.

SAMPLE NO. 1. This was described as having been obtained within three inches of the surface. The specimen weighed about five ounces, and consisted of a reddish-brown earthy powder.

SAMPLE NO. 2. This was collected at a depth of six inches; it weighed about six ounces and consisted of a dark brown earthy powder.

SAMPLE NO. 3. This specimen was obtained at a depth of one foot. It weighed about six ounces and was composed of a light yellowish-brown moist powder.

CHEMICAL EXAMINATION.

The four samples of bat guanos were chemically examined in the Scientific and Technical Department of the Imperial Institute, and gave the following results:—

	A.	No. 1.	No. 2.	No. 3.
	per cent.	per cent.	per cent.	per cent.
Silica SiO_2	8.42	31.62	19.79	21.77
Alumina Al_2O_3	2.56	11.36	10.78	10.70
Ferric oxide Fe_2O_3	1.75	11.03	9.05	8.28
Manganous oxide MnO	.31	.20	.19	.13
Lime CaO	22.27	1.81	1.86	2.32
Magnesia MgO	trace	1.03	1.04	.95
Cupric oxide CuO	.34	.37	.35	.34
Potash K_2O	2.01	1.12	.88	.88
Soda Na_2O	1.30	.78	.75	.79
Ammonia NH_3	.58	.12	.14	.12
Nitric acid N_2O_5	7.55	.81	.91	.86
Phosphoric acid P^2O_5	17.52	8.60	10.86	14.17
Sulphuric acid SO_3	16.32	.41	.53	.50
Chlorine C	.13	trace	trace	
Combined water H_2O	4.36	2.91	2.62	2.24
Moisture	9.59	21.26	22.92	26.60
Organic matter	4.88	6.57	17.21	9.62
Total nitrogen	2.47	.81	1.52	.84
Phosphoric acid soluble in water	.81			
Phosphoric acid soluble in ammonium citrate solution	3.25	7.38	8.54	9.75

These results show that although these guanos are comparatively rich in phosphoric acid—of which a fairly large proportion is soluble in ammonium citrate solution and is therefore in a form in which it could be utilised by plants—they are deficient in the very important constituents, potash and nitrogen. The guano of commerce obtained in Chili and Peru contains as a rule from 7 to 12 per cent. of "total nitrogen," 11 to 14 per cent. of phosphoric acid, 3 to 6 per cent. of potash, and 11 to 15 per cent. of lime (present as calcium phosphate). Comparing these figures with those obtained in the course of this examination of the bat guanos from the Federated Malay States, it will be seen that although the latter are fairly rich, particularly as regards samples A and 3, in phosphoric acid, yet this deficiency in the other important constituents of manures—viz., potash and nitrogen—would prevent their being used as general manures in the same way as South American guanos, and they could only be satisfactorily employed in conjunction with other materials rich in potash and nitrogen. They resemble to some extent the so-called phosphate guanos, now imported in considerable quantities into this country, which, however, contain as a rule at least 30 per cent. of phosphoric acid in the form of calcium phosphate.

The best of the four bat guanos from the Federated Malay States is sample A, which contains 2 per cent. of potash, 2.47 per cent. of nitrogen in the form of ammonium nitrate, and 17.52 per cent. of phosphoric acid in the form of ferric, aluminium and calcium phosphates. An unusual constituent of this sample is 28 per cent. of calcium sulphate. The phosphoric acid content of this guano would be worth about £2 16*s*. per ton in this country, and it is unlikely that the small amounts of "nitrogen" and potash present would enhance its commercial value. This price is undoubtedly too low to permit of profitable export, and it would probably prove more remunerative to employ the guano locally. In this connection it may be mentioned that the calcium sulphate present in the material, though of no direct value as a manure, might be utilised indirectly by using the guano in conjunction with dung or any similar material which would undergo ammoniacal fermentation, as the ammonia and carbon dioxide generated by the fermentation would convert the calcium sulphate into ammonium sulphate and calcium carbonate, thus affording at once two important constituents of manures, viz., "nitrogen" and lime, in forms in which they can be readily assimilated by plants. Calcium sulphate is frequently used in this way as an indirect manurial agent, and is regularly mined in the United Kingdom for this purpose.

The other guanos, Nos. 1, 2 and 3, would be of comparatively little commercial value in this country, but there is no reason why they should not be utilised in the Federated Malay States as phosphatic manures. When used in this way it must be understood that the soils to which they are applied may also require applications of other manures containing nitrogen and potash. It is noticeable that in samples Nos. 1, 2 and 3, taken at the surface, and six inches and twelve inches deep, respectively, the amount of phosphoric acid present increases with the depth at which the sample is taken, and it is possible therefore that at still greater depths material richer in phosphoric acid than the best of these samples may be obtained.

COMMERCIAL VALUATION.

Samples of the four guanos were submitted to dealers in guano, who were also informed of the results of their chemical examination, for commercial valuation. They stated that large deposits of bat guano occur in Mexico, Borneo, Algeria, Jamaica and elsewhere, and that small consignments, similar in composition to those now sent from the Federated Malay States, had occasionally been sent to this country, but that the material had not been received with favour, and there was reason to believe that these shipments had not proved remunerative to the exporters, and as a result no regular trade in this product has become established. The Imperial Institute will be glad to supply any further information regarding methods of utilising these products which may be required.

WYNDHAM R. DUNSTAN.

23*rd June*, 1905.

IMPERIAL INSTITUTE.

(SOUTH KENSINGTON, LONDON, S. W.)

REPORT ON SAMPLES OF PATCHOULI AND CITRONELLA OILS FROM PERAK, MALAY PENINSULA.

BY

PROFESSOR WYNDHAM R. DUNSTAN, M.A., F.R.S., *Director.*

These two samples of volatile oils were forwarded to the Imperial Institute by Mr. W. K. SMITH, of the Kellas Estate, Perak, together with a letter dated the 21st December, 1904, at the suggestion of the Superintendent of the Botanic Gardens, Singapore, and it was requested that they might be examined and their quality and commercial value ascertained.

CITRONELLA OIL.

DESCRIPTION OF SAMPLE.

The sample measured about four fluid ounces and was labelled "Citronella Oil, distilled on the Kellas Estate, 20th December, 1904." The oil was of a pale yellow colour and possessed the characteristic fragrant odour of citronellal; it was quite clean and free from water.

CHEMICAL EXAMINATION.

The oil was chemically examined in the Scientific and Technical Department of the Imperial Institute, and gave the results recorded in the following table, which also gives, for convenience of comparison, the average results obtained in the analysis of other citronella oils of commerce.

—	Sample from Kellas Estate.	Java oil.	Ceylon oil.
Specific gravity ...	0.8948 at 15° C. ...	0.892	0.908
Refractive index ...	1.4858 at 24° C.		
Optical rotation in 100 mm. tube	—1 34′ at 24° C. ...	– 0° 50′ to 2° 26′...	—9° 36′
Solubility in 80 per cent. alcohol	1 in 1 or more vols of alcohol	1 in 1 or more vols of alcohol	1 in 1 vol. becoming cloudy on further addition of alcohol
Geraniol	32.7 per cent. ...	31.9 to 38.1 per cent.	32.9 per cent.
Citronellal (by difference)	55.3 " ...	50.4 to 55.3 "	28.2 "

These results show that this sample of citronella oil from the Kellas Estate is of good quality, and that in composition it more nearly approximates to Java oil than to that produced in Ceylon.

COMMERCIAL VALUATION.

A sample of the oil was submitted to a firm of commercial experts, who were also informed of the results of the chemical examination, for valuation. They reported that the oil was very similar to samples of the same material previously received from Singapore and that it would be worth about 2*s.* per pound. On the same day Ceylon citronella oil was quoted at 1*s.* 6½*d.* to 1*s.* 7*d.* per pound.

PATCHOULI OIL.

DESCRIPTION OF SAMPLE.

The sample measured about four fluid ounces and was labelled "Pure Patchouli Oil, distilled on the Kellas Estate, 7th December, 1904." The oil was of a dark lemon yellow colour and possessed the characteristic strong persistent odour of patchouli.

CHEMICAL EXAMINATION.

The sample was examined in the Scientific and Technical Department of the Imperial Institute, and gave the results recorded in the following table, to which have been added the results given by other samples of commercial patchouli oil.

—	Oil from Kellas Estate.	Oil imported from Singapore.	Oil distilled from Patchouli leaves in Germany.
Specific gravity ...	0.9525	0.957 to 0.965	0.970 to 0.995
Optical rotation in 100 mm. tube	—43° 31′	—44° to —50°	—50° to —68°
Refractive index ...	1.5063	...	...
Solubility in 90 per cent. alcohol	1 in 7.4 vols. ...	1 in from 3 to 7 vols.	1 in 1 vol.

These results indicate that this sample of patchouli oil from the Kellas Estate is of fair quality, and that it conforms to the general type of patchouli oils exported from Singapore.

COMMERCIAL VALUATION.

A small sample of the oil was submitted, together with the results of its chemical examination, to a firm of manufacturing perfumers for commercial valuation. It is reported that the oil would probably be worth about 16*s*. per pound at present. It is also stated that there has been a marked decrease in the consumption of patchouli oil in perfumery in recent years, and that this, in conjunction with over-production in the Federated Malay States, Java and Indo-China, has led to low prices for this oil.

The results of the investigation of these two oils show that they are both of good quality and compare favourably in composition with oils of the same type already imported into this country, and that consignments would probably fetch good prices on the London market.

(Sd.) WYNDHAM R. DUNSTAN.

16*th June*, 1905.

ON 3 INSECT PESTS OF MANGO TREES.

BY J. HEWITT.

In the month of August of this year a gentleman living in Kuching called my attention to the sickly condition of many of his Mango trees. On inspection it was found that whole branches gradually withered and died although the tree as a whole retained its vitality. It was obvious that this was the ravages of some insect for on splitting the dying branches one found the wood penetrated by long tunnels which reached sometimes a length of several feet. Apparently one individual insect can do much damage for in these borings one branch never lodged more than one insect. This was a large white fat grab with a small head and swollen thorax, the anterior thoracic segment in particular being enlarged: the thorax was provided with 3 pairs of rudimentary legs. The abdomen was conspicuously segmented: dorsally and ventrally all the segments—with the exception of the last 2 abdominal, and the first thoracic dorsally—bear tuberculated humps which seem to subserve a gripping function. The length of the larva was 2 inches or more. Fortunately I was able to find one adult insect and to rear a pupa. As one could expect from a larva of the type described it belonged to the longicorn beetles, the actual species being Rhytidodera simulans White. This beetle of length usually just over an inch, is of a dull reddish brown colour marked with yellowish spots which on the elytra are longitudinally elongated and arranged so as to mark it irregularly by transverse bands.

Besides this however the same trees were infested by another kind of larva whose work on the tree is more superficial. Its presence was revealed by finding on the surface of the bark long arched tunnels of irregular direction reminding one of the similar structures made by white ants: the delicate fabric of the arch was made up of tiny particles of Mango bark closely bound together by numerous silky filaments secreted by the animal. This larva was a caterpillar of length about one inch: dorsally it is dark brown in colour and its skin is chitinously thickened except at the joints where it is thin and of a pale colour. Ventrally also it is pale. Each segment bears a few bristly hairs: abdominal segments 3, 4, 5, 6 and 9 each have a pair of prolegs.

When this animal is irritated it vomits a dark brown juice.

It is usually to be found in a self constructed pit situated at one end of the tunnel: it evidently leaves the tunnel at times—probably at night for the bark of the tree has been gnawed away over a fairly large area in the vicinity of the tunnel. To some extent this caterpillar also bores into the wood but scarcely sufficiently to do much damage in that direction. A number of these larvæ were taken away in a corked tube in the hope of rearing the image: one caterpillar discovered the cork and entered it. This it riddled in all directions and then constructed some arched tunnels on the surface. After a period of about two months a small moth emerged from the interior of the cork. It proved to be a species of Arbela, a genus allied to the English Cossus, the goat moth. This small moth is rather stout, has white hind wings and the pale front wings bear two elongated brown spots. The third insect found on these trees is the small beetle which occurs in all stages of its life history in the Mango fruit and which is so well known as not to require description again. It belongs to the family Curculionidæ (*weevils*) and is known as *Cryptorhynchus mangiferæ.*

The infested trees were of the species, Mangifera fœtida known to Malays as Bachang or Lembachang.

JOHN HEWITT.

RUBBER PHOTOGRAPHS.

The India-rubber Journal of July 31st, 1905, contains under the International Rubber Planters Association notes, a series of 18 unusually fine photographs of Para Rubber and Ficus Elastica trees taken by Mr. P. W. BURGESS in the Botanic Gardens and Lanadron Estate. The photographs show growth, methods of tapping the crepe machine, and the prepared material, and form a most instructive series of photographs; explanatory notes are given with the pictures. The pamphlet is on sale at the price of sixpence to members of the association on application to the publishers.—*Editor.*

THE FEDERATED ENGINEERING COMPANY LIMITED.
ENGINEERS, IRON AND BRASS FOUNDERS AND CONTRACTORS.

KUALA LUMPUR, *October 24th*, 1905.

Dear Sir,—Believing you to be interested in the economical cultivation and production of India Rubber, we take the liberty of laying before you a few of the advantages that may be obtained by the use of our Rubber Washing and Rubber Rolling Machines.

As you are probably aware, we were the first to take up the manufacture of a special machine for the treatment of freshly coagulated latex, and in July, 1905, we exhibited an experimental machine at the Agri-Horticultural Show held in Kuala Lumpur.

The machine was shown doing actual work and producing crêpe rubber from latex, kindly provided by many local planters.

The very great success of the machine and high enconiums expressed by Mr. P. BURGESS, the Straits Government Analyst, on the excellent results of using such a machine in purifying the rubber, induced us to go further into the matter.

We were fortunate in obtaining orders for six machines during the three days the Show was open, and we then re-designed our machine and placed on the market our now well known 1904 Pattern.

Since then experience has taught us many little detailed improvements and we are now suyplying our 1905 Pattern Washing Machine and also a Rolling Machine of almost identical design; the only difference between the two being that the Rolling Machine has smooth rollers and is geared to a 1 : 1 ratio instead of the fluted rollers and 1½ : 1 ratio of the Washer.

The advantages of using our Machines for the production of marketable rubber are many and various, and the more important points are briefly enumerated below:—

(1) The action of the rollers on the freshly coagulated latex is to entirely remove all albumen, and other impurities which remain in the rubber (to its consequent detriment) if made into biscuits.

(2) The crêpe after being treated on the two machines has a close, fine, even texture and is extremely thin, and can thus be dried, without the aid of an artificial drying house, in about three days, and is considerably easier to pack for shipment than in the biscuit form.

(3) The machines working together will treat at the very least one hundred pounds of dried rubber per hour or singly fifty pounds per hour, and each machine requires from five to eight brake horse power to drive it; only one man is required to feed a machine and the saving effected over the handmade biscuit process is obvious.

(4) By the manufacture of crêpe rubber the disadvantages of having a large number of coagulating dishes and trays are obviated as the latex is all poured into one large receptacle and there

coagulated in bulk by the addition of Acetic Acid, Tannic Acid of other coagulating agent, after which it is cut into slabs and fed into the Washing Machine.

The process of making the crêpe may be entirely carried out on the Washing Machine and many estates are doing this, although a much finer sample is obtained by passing the washed rubber through the rolling machine, and most users are adopting this system, which produces crêpe rubber of identical form and appearance with that made by Home Manufacturers.

As you will understand, we have devoted a considerable amount of time and money in experimenting in order to obtain the best results possible, and in this connection, we have already had the very hearty co-operation of the local Planters who continue to show their faith in the crêpe process by purchasing our machines.

We have made enquiries from Home Manufacturers and from Agents in this part of the world and have found that we are offering machines to the public which compare favourably with any manufactured elsewhere, and our price defies competition, while users have the advantage that our machines have been especially designed for a specific purpose, viz., the treatment of freshly coagulated latex, and are not tearing or mixing machines built on Home experience, which is necessarily limited to the treatment of rubber shipped from afar, and which requires softening before treatment.

Our price for the Washing Machine is £40 nett Cash *ex* Works, and that of the Rolling Machine the same.

We also have in hand a mechanical coagulating device which is still in the experimental stage, but the principle of which has been fully protected by the inventors and the machine will be very shortly on the Market.

Trusting to hear from you and assuring you that we will at all times be only too willing to give you any assistance possible on this or any other subject which appertains to Machinery.

We are,
Dear Sir,
Yours faithfully,
The FEDERATED ENGINEERING Co., Ltd.

P. S.

Nett weight of Washing or Rolling Machine complete 1,120 lbs.
Gross weight including packing ... ... 1,360 lbs.

REGISTER OF RAINFALL AT NEGRI SEMBILAN HOSPITALS, FOR AUGUST, 1905.

Date.	Seremban.		K. Pilah.		Tampin.		Jelebu.		Port Dickson.		Mantin.	
	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.
1	...	...	...	...	...	...	...	...	..	...	...	...
2	...	36	...	30	...	34	...	14	...	...	...	67
3	...	11	...	50	...	79	...	21	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	01
5	...	...	...	25	..	42	...	15	...	...	...	...
6	...	23	...	...	...	09	...	13	...	...	2	24
7	...	...	...	...	...	10	...	...	1	00	...	08
8	1	31	...	...	...	14	...	..	...	...	...	59
9	...	07	...	...	...	38	...	23	1	54	...	34
10	...	84	...	...	...	...	...	07	...	65	...	08
11	...	67	1	30	1	07	...	...	...	65	...	02
12	1	26	...	40	1	10	...	...	...	55	1	95
13	...	62	...	..	...	42	...	53	4	15	...	45
14	...	...	...	25	...	02	...	...	1	35	...	...
15	...	30	...	40	...	...	...	...	...	...	...	16
16	...	...	...	...	...	31	...	...	1	32	...	...
17	...	...	...	...	...	05	...	43	...	62	...	63
18	...	...	...	...	...	10	...	...	...	55	...	...
19	1	39	...	...	...	05	...	45	...	...	...	09
20	...	43	...	12	...	08	...	23	...	82	...	...
21	...	...	...	...	...	...	...	30	...	...	...	...
22	...	...	...	...	...	24	...	02	...	...	...	...
23	...	27	...	08	...	02	...	...	...	...	...	82
24	...	05	...	...	...	02	...	...	...	74	...	08
25	...	32	...	15	...	24	...	22	...	...	...	34
26	1	39	...	...	1	35	...	23	...	...	1	24
27	...	...	...	75	...	...	...	...	...	80	...	02
28	...	...	...	...	...	...	...	03	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...
Total	9	62	4	50	7	33	3	37	14	74	9	81

R. VAN GEYZEL,
Apothecary.

State Surgeon's Office,
Seremban, 11*th September*, 1905.

SINGAPORE MARKET REPORT.

September, 1905.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$ c.	$ c.
Coffee—Palembang	12	25.00	24.00
Bali	...	22.00	22.00
Liberian	78	25.00	23.00
Copra	3,955	7.55	6.95
Gambier	2,370	8.75	8.57½
Cube Gambier, Nos. 1 & 2	345	12.25	11.50
Gutta Percha, 1st quality	...	300.00	150.00
Medium	...	200.00	90.00
Lower	...	80.00	12.00
Borneo Rubber 1, 2, and 3	...	135.00	92.00
Gutta Jelutong	...	7.25	6.50
Nutmegs, No. 110's	...	35.00	34.00
No. 80's	...	57.00	56.00
Mace, Banda	...	87.00	80.00
Amboyna	...	55.00	54.00
Pepper, Black	631	28.25	25.50
White (Sarawak)	584	38.50	35.50
Pearl Sago, Small	...	4.87½	4.87½
Medium	...	...	...
Large	...	...	...
Sago Flour, No. 1	3,160	3.17½	2.85
No. 2	155	.80	.80
Flake Tapioca, Small	604	7.60	7.30
Medium	...	...	...
Pearl Tapioca, Small	111	6.50	6.10
Medium	495	6.90	6.35
Bullet	...	7.50	7.25
Tin	1,620	83.50	80.12½

Export Telegram to Europe and America.

Fortnight ending 15th September, 1905.

Wired at 2.55 P.M. on 16th September, 1905.

				Tons.
Tin	Str.	Singapore and Penang to	United Kingdom &/or	1,066
Do.	,,	Do.	U. S. A.	530
Do.	,,	Do.	Continent	505
Gambier	,,	Singapore	Glasgow	...
Do.	,,	Do.	London	...
Do.	,,	Do.	Liverpool	150
Do.	,,	Do.	U. K. &/or Continent	...
Cube Gambier	,,	Do.	United Kingdom	30
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Singapore	Do.	70
Do.	,,	Penang	Do.	...
Pearl Sago	,,	Singapore	Do.	15
Sago Flour	,,	Do.	London	75
Do.	,,	Do.	Liverpool	1,800
Do.	,,	Do.	Glasgow	100
Tapioca Flake	,,	Singapore & Penang	United Kingdom	85
T. Pearl & Bullets	,,	Do.	Do.	290
Tapioca Flour	,,	Penang	Do.	50
Gutta Percha	,,	Singapore	Do.	50
Buffalo Hides	,,	Do.	Do.	55
Pineapples	,,	Do.	Do.	cases 5,500
Gambier	,,	Do.	U. S. A.	500
Cube Gambier	,,	Do.	Do.	45
Black Pepper	,,	Do.	Do.	240
Do.	,,	Penang	Do.	150
White Pepper	,,	Singapore	Do.	210
Do.	,,	Penang	Do.	40
T. Flake & Pearl	,,	Singapore & Penang	Do.	500
Nutmegs	,,	Do.	Do.	38
Sago Flour	,,	Singapore	Do.	225
Pineapples	,,	Do.	Do.	cases 700
Do.	,,	Do.	Continent	,, 900
Gambier	,,	Do.	S. Continent	100
Do.	,,	Do.	N. Continent	270
Cube Gambier	,,	Do.	Continent	50
Black Pepper	,,	Do.	S. Continent	100
Do.	,,	Do.	N. Continent	30
Do.	,,	Penang	S. Continent	10
Do.	,,	Do.	N. Continent	...
White Pepper	,,	Singapore	S. Continent	25
Do.	,,	Do.	N. Continent	40
Do.	,,	Penang	S. Continent	...
Do.	,,	Do.	N. Continent	...
Copra	,,	Singapore & Penang	Marseilles	640
Do.	,,	Do.	Odessa	820
Do.	,,	Do.	Other South Continent	640
Do.	,,	Do.	N. Continent	3,000
Sago Flour	,,	Do.	Continent	1,025
Tapioca Flake	,,	Singapore & Penang	Do.	60
Do. Pearl	,,	Do.	Do.	110

				Tons
Copra	Str.	Singapore	England	50
Gambier	,,	Do.	U. S. A.	...
Cube Gambier	,,	Do.	Do.	...
T. Flake and Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	...
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	...
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	...
Pineapples	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Do.	Do.	...
T. Flake & Pearl	,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...

1,000 tons Gambier } Contracts.
370 ,, Black Pepper }

Export Telegram to Europe and America.

Fortnight ending 30th September, 1905.

Wired at 2.30 P.M. on 2nd October, 1905.

				Tons.
Tin	Str.	Singapore & Penang to	United Kingdom &/or	2,290
Do.	,,	Do.	U. S. A.	225
Do.	,,	Do.	Continent	300
Gambier	,,	Singapore	Glasgow	...
Do.	,,	Do.	London	50
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	U. K. &/or Continent	110
Cube Gambier	,,	Do.	United Kingdom	15
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Singapore	Do.	190
Do.	,,	Penang	Do.	...
Pearl Sago	,,	Singapore	Do.	...
Sago Flour	,,	Do.	London	300
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	Glasgow	25
Tapioca Flake	,,	Singapore & Penang	United Kingdom	190
T. Pearl & Bullets	,,	Do.	Do.	125
Tapioca Flour	,,	Penang	Do.	230
Gutta Percha	,,	Singapore	Do.	25
Buffalo Hides	,,	Do.	Do.	30
Pineapples	,,	Do.	Do.	cases 3,500
Gambier	,,	Do.	U. S. A.	320
Cube Gambier	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	250
Do.	,,	Penang	Do.	35
White Pepper	,,	Singapore	Do.	95
Do.	,,	Penang	Do.	...
T. Flake & Pearl	,,	Singapore & Penang	Do.	260
Nutmegs	,,	Do.	Do.	22
Sago Flour	,,	Singapore	Do.	50

				Tons.
Pineapples	Str.	Singapore	To U. S. A.	cases 1,750
Do.	,,	Do.	Continent	,, 2,000
Gambier	,,	Do.	S. Continent	25
Do.	,,	Do.	N. Continent	325
Cube Gambier	,,	Do.	Continent	70
Black Pepper	,,	Do.	S. Continent	20
Do.	,,	Do.	N. Continent	10
Do.	,,	Penang	S. Continent	10
Do.	,,	Do.	N. Continent	...
White Pepper	,,	Singapore	S. Continent	5
Do.	,,	Do.	N. Continent	50
Do.	,,	Penang	S. Continent	...
Do.	,,	Do.	N. Continent	...
Copra	,,	Singapore & Penang	Marseilles	200
Do.	,,	Do.	Odessa	200
Do.	,,	Do.	Other S. Continent	...
Do.	,,	Do.	N. Continent	380
Sago Flour	,,	Singapore	Continent	250
Tapioca Flake	,,	Singapore & Penang	Do.	175
Do. Pearl	,,	Do.	Do.	140
Copra	,,	Singapore	England	50
Gambier	,,	Do.	U. S. A.	...
Cube Gambier	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	...
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	...
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	...
Pineapples	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...

1,450 tons Gambier } Contracts.
260 ,, Black Pepper }

Singapore.

Abstract of Meteorological Readings for the month of September, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·908	139·9	81·1	89·2	74·5	14·7	77·6	·864	75·2	78	S.E. S.S.E.	2·89	0·88

A. B. LEICESTER,
Meteorological Observer.

D. K. McDowell,
Principal Civil Medical Officer, S. S.

Kandang Kerbau Hospital Observatory,
Singapore, 16*th October*, 1905.

Penang.

Abstract of Meteorological Readings in the Prison Observatory for the month of September, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Mean Maximum.	Mean Minimum.	Mean Range.	Mean Wet Bulb.	Mean Vapour Tension.	Mean Dew Point.	Mean Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	°F	%		Ins.	Ins.
Criminal Prison Observatory, ...	29·862	141·8	79·8	88·1	73·1	15·0	74·7	·760	70·44	69	S.	8·05	1·72

COLONIAL SURGEON'S OFFICE,
PENANG, 11*th October,* 1905.

M. E. SCRIVEN,
Assistant Surgeon.

S. LUCY,
Acting Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for the month of September, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Durian Daun Hospital	29·815	156·6	82·6	88·2	75·1	13·2	80·1	·998	72·0	89	E.	3·54½	·98

COLONIAL SURGEON'S OFFICE,
MALACCA, 17*th October*, 1905.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of September, 1905.

DISTRICT.		Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
				Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping	...	...	150	81·40	93	68	25	76·68	856	...	79	...	7·84	2·07
Kuala Kangsar	...	...	...	79·47	92	68	24	75·24	821	...	81	...	9·04	2·64
Batu Gajah	...	...	160	80·44	92	68	24	76·06	843	...	81	...	7·81	1·81
Gopeng	...	...	...	79·90	93	64	29	75·41	821	...	80	...	12·29	2·73
Ipoh	...	...	...	79·93	92	70	22	76·09	851	...	83	...	10·96	1·59
Kampar	...	...	...	...	...	65	...	...	...	...	...	..	14·20	2·57
Teluk Anson	...	...	...	80·51	91	67	24	76·71	870	...	84	...	10·72	1·72
Tapah	...	...	...	80·21	92	65	27	75·69	829	...	80	...	14·08	2·84
Parit Buntar	...	...	...	81·96	94	71	23	77·31	876	...	81	...	13·80	2·38
Bagan Serai	...	...	...	81·07	92	67	25	76·30	845	...	79	...	8·41	4·11
Selama	...	...	...	81·09	91	69	22	76·75	864	...	81	...	12·30	2·40

STATE SURGEON'S OFFICE,
TAIPING, 10*th October*, 1905.

M. J. WRIGHT,
State Surgeon.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of September, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·883	146·9	80·3	89·5	70·8	18·7	76·2	0·828	72·5	79	Calm.	6·51	2·75
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	8·47	2·17
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	7·05	1·40
,, Klang	...	...	...	88·1	70·1	18·0	...	...	...	...	...	5·71	1·75
,, Kuala Langat	...	...	...	...	...	...	...	...	...	...	...	1·05	0·30
,, Kajang	...	...	...	89·7	71·3	18·4	...	...	...	...	...	7·68	2·21
,, Kuala Selangor	...	...	...	...	...	...	...	...	...	...	...	3·73	1·20
,, Kuala Kubu	...	...	...	90·8	71·5	19·3	...	...	...	...	...	9·88	2·37
,, Serendah	...	...	...	88·5	71.3	17·2	...	...	...	...	...	8·57	1·42
,, Rawang	...	...	...	89·9	69·8	20·1	...	...	...	...	...	7·77	1·25
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	3·78	1·00
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	...	5·26	1·35

State Surgeon's Office,
Kuala Lumpur, 19*th October*, 1905.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for the month of April, 1905.

DISTRICT.		Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
				Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis	...	...	...	...	95·0	70·0	19·40	...	...	...	...	...	2·70	1·04
Raub	...		...	...	92·0	67·0	20·40	...	...	...	...	...	4·43	1·58
Bentong	...	...	...	...	94·5	69·5	18·35	...	...	...	...	...	6·63	1·62
Pekan	...	...	...	...	90·0	72·0	13·25	...	...	...	...	...	6·54	2·64
Kuala Kuantan	...	...	...	...	90·0	68·0	14·10	...	...	...	...	...	8·55	3·75
Temerloh	...	...	...	...	93·0	72·0	16·20	...	...	...	...	...	4.41	1·35

KUALA LIPIS,

7th October, 1905.

W. H. FRY,

State Surgeon, Pahang.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for the month of May, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Kuala Lipis ...	...	...	...	94·0	70·0	17·84	...	...	...	...	...	9·88	2·93
Raub ...	...	...	...	92·0	70·0	16·74	...	...	...	...	...	4·56	·85
Bentong ...	...	...	...	92.0	69·5	16·39	...	...	...	...	...	7·01	1·50
Pekan ...	...	...	...	89.0	72·0	12·35	...	...	...	...	...	9·16	4·81
Kuala Kuantan ...	...	...	...	89.0	70·0	12·78	...	...	...	...	...	7·82	1·56
Temerloh ...	...	...	...	95.0	72·0	15·90	...	...	...	...	...	10·26	1·50

KUALA LIPIS,

7th October, 1905.

W. H. FRY,

State Surgeon, Pahang.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for the month of June, 1905.

District.	Mean Barometrical Pressureat 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Tapour Tension.	Dew Point.	Humidity.			
Kuala Lepis ...	...	...	...	93·0	69·0	18·86	...	...	...	...	...	4·17	1·46
Raub ...	...	...	...	93·0	69·0	18·96	...	...	...	...	...	2·16	·70
Bentong ...	...	...	...	92·0	68·5	18·80	...	...	...	...	...	3·92	1·00
Pekan ...	...	...	...	90·0	72·0	14·01	...	...	...	...	...	3·65	1·16
Kuala Kuantan ...	...	...	...	91·0	72·0	12·96	...	...	...	...	...	6·26	3·26
Temerloh ...	...	...	...	95·0	72·0	16·90	...	...	...	...	...	2·95	·85

KUALA LIPIS,

7th October, 1905.

W. H. FRY,

State Surgeon, Pahang.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for the month of July, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis ...	...	...	...	93·0	68·0	18·58	...	...	...	...	...	5·64	1·83
Raub ...	...	...	...	94·0	68·0	18·31	...	...	...	...	...	5·61	1·23
Bentong ...	...	...	...	92·0	68·5	18·91	...	...	...	...	...	3·96	·77
Pekan ...	...	...	...	90·0	70·5	14·13	...	...	...	...	...	5·84	2·11
Kuala Kuantan ...	...	...	...	89·0	71·0	12·93	...	...	...	...	...	3·24	1·12
Temerloh ...	...	...	...	96·0	72·0	16·45	...	...	...	...	...	2·79	·61

KUALA LIPIS,

7th October, 1905.

W. H. FRY,

State Surgeon, Pahang.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for the month of August, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis ...	...	...	...	92·0	67·0	17·97	...	...	...	...	...	4·37	1·02
Raub ...	...	...	...	92·0	67·0	17·82	...	...	...	...	...	9·19	1·77
Bentong ...	...	...	...	94·0	68·5	18·16	...	...	...	...	...	5·33	1·30
Pekan ...	...	...	...	89.0	71·0	14·81	...	...	...	...	...	4·22	1·53
Kuala Kuantan ...	...	...	...	91·0	71·0	12·78	...	...	...	...	...	7·10	1·92
Temerloh ...	...	...	...	92·0	70·0	16·53	...	...	...	...	...	4·53	1·45

KUALA LIPIS,

7th October, 1905.

W. H. FRY,

State Surgeon, Pahang.

Pahang.

Abstract of Meteorogical Readings in the various Districts of the State for the month of September, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis ...	...	...	...	92·0	68·0	17·57	...	...	...	...	...	8·63	1·50
Raub ...	...	...	...	90·5	68·0	17·03	...	...	...	...	...	6·37	1·84
Bentong ...	...	...	...	92·0	66·0	18·45	...	...	...	...	...	4·14	·45
Pekan ...	...	...	...	93·0	63·0	14·16	...	...	...	...	...	5·23	1·58
Kuala Kuantan ...	...	...	...	90·0	68·0	12·80	...	...	...	...	...	5·96	1·85
Temerloh ...	...	...	...	92·0	70·0	16·10	...	...	...	...	...	6·41	1·22

KUALA LIPIS,

4th November, 1905.

W. H. FRY,

State Surgeon, Pahang.

Muar.

Abstract of Meteorological Readings for the month of September, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Lanadron Estate ...	...	...	80°	89°	71°	18°	74°	...	...	...	...	6·92	1·69

MUAR, *3rd October*, 1905.

ROGER PEARS.

The Duff Development Company, Limited, Kelantan.

Abstract of Meteorological Readings for the month of September, 1905.

DISTRICT.	Temperature.			Rainfall.	
	Maximum.	Minimum.	Range.	Total Rainfall.	Greatest Rainfall during 24 hours.
	Mean. °F	Mean. °F	Mean. °F	Inches.	Inches.
Kuala Lebir ...	88·0	70·4	17·6	9·79	2·15
Ulu Liang ...	86·9	71·5	15·9	9·04	2·02
Kuala Kelantan ...	85·6	70·3	12·3	4·36	1·17

SURGEON'S OFFICE,
11*th October*, 1905.

JOHN D. GIMLETTE,
Surgeon.

METEOROLOGICAL OBSERVATIONS.

Table Showing the Daily Results of the Reading of Meteorological Observations taken at the General Hospital, Seremban, for the Month of August, 1905.

Date.	Temperature of radiation.						Temperature of radiation.				Wind. Direction.		Temperature of evaporation.			Computed vapour tension.			Relative humidity.			Clouds 0 to 10.			Cloud and weather Initials.			Rain.
	9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Sun.	Difference sun and shade.	Grass.	Difference shade and radiation.	9 H	15 H	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	21 H	9 H	15 H	21 H	Inches.
	°	°	°	°	°	°	°	°	°	°			°	°	°	in.	in.	in.	°	°	°							
1	77	80	78·5	86	72	14	148	62	...	...	S.E.	S.E.	73·6	76·6	75·1	0·829	0·916	0·872	89	90	89·5	0	5	0	B	C	B	
2	79	86	82·5	87	72	15	151	64	...	...	S.E.	S.E.	72·3	74·	73·1	·793	·855	·824	80	68	74	0	3	10	B	C	R	.36
3	79	78	78·5	86	72	14	143	57	...	...	E.	S.W.	73·9	76·3	75·1	·839	·906	·872	85	94	89·5	0	10	5	B	R	C	.11
4	78	80	79	86	72	14	154	68	...	...	S.E.	S.E.	72·9	76·6	74·7	·810	·916	·863	84	90	87	0	3	5	B	C	C	
5	81	88	84·5	88	73	15	156	68	...	...	S.E.	S.E.	74·2	73·3	73·7	·849	·819	·834	80	61	75	0	0	5	B	B	C	
6	73	80	76·5	85	73	12	96	11	...	...	S.E.	S.E.	69·5	73·3	71·4	·722	·820	·771	89	80	84·5	10	3	10	R	C	R	.23
7	73	82	77·5	86	73	13	145	59	...	...	S.E.	S.N.	69·5	75·3	72·4	·722	·877	·799	89	80	84·5	5	2	3	C	B	C	
8	76	78	77	86	72	14	136	50	...	...	S.E.	S.E.	69·2	74·6	71·9	·713	·857	·785	79	89	84	3	10	5	C	R	C	1.31
9	77	78	77·5	85	72	13	135	50	...	...	N.E.	N.S.	73·6	72·9	73·2	·829	·810	·819	89	84	86·5	3	5	5	C	C	C	.07
10	81	80	80·5	84	70	14	156	72	...	...	S.E.	S.E.	72·6	76·6	74·6	·802	·916	·859	76	90	83	0	10	5	B	R	C	.84
11	77	78	77·5	84	70	14	145	61	...	...	S.E.	S.E.	73·6	76·3	74·9	·829	·906	·867	89	94	91·5	3	10	5	C	R	C	.67
12	77	84	80·5	84	73	11	156	72	...	...	S.E.	N.E.	71·9	74·	72·9	·783	.840	·811	84	72	78	2	0	3	B	B	C	1.26
13	76	82	79	84	72	12	155	71	...	...	S.E.	S.	69·2	72·	70·6	·713	·785	·749	79	72	75·5	3	0	0	C	B	B	.62
14	80	83	81·5	84	71	13	135	51	...	...	S.E.	S.	75·	73·	74·	·867	·810	·838	85	72	78·5	0	0	0	B	B	B	
15	79	84	81·5	86	71	15	144	58	...	...	S.E.	S.	73·9	72·4	73·1	·839	·794	·816	85	68	76·5	0	0	0	B	B	B	.30
16	74	83	78·5	85	71	14	143	58	...	...	S.E.	S.	72·3	74·7	73·5	·793	·856	·824	94	76	85	5	3	0	C	C	B	
17	76	83	79·5	84	72	12	125	41	...	...	S.E.	S.	70·9	74·7	72·8	·856	·856	·806	84	76	80	3	3	0	C	C	B	
18	75	80	77·5	82	72	10	115	33	...	...	S.E.	S.E.	71·6	76·6	74·1	·774	·916	·845	89	90	89·5	3	3	0	C	C	B	
19	82	77	79·5	87	73	14	157	70	...	...	S.E,	S.W.	73·6	73.6	73·6	·830	·829	·829	76	89	82·5	0	10	0	B	R	B	1.39
20	81	79	80	86	71	15	146	60	...	...	S.W.	S.E.	74·2	73.9	74·	·849	·839	·844	80	85	82·5	0	10	10	B	R	R	.43
21	77	83	80	84	73	11	153	69	...	...	S.E.	S.E.	73·6	74·7	74·1	·829	·856	·742	89	76	82·5	3	3	5	C	C	C	
22	79	85	82	85	72	13	142	57	...	...	E.	S.E.	72·3	71·8	72·	·793	·781	·787	80	64	72	0	0	0	B	B	B	
23	76	82	79	87	71	16	153	66	...	...	S.E.	S.E.	72·6	73·6	73·1	·801	·830	·815	89	76	82·5	3	5	3	C	C	C	.27
24	75	83	79	84	73	11	157	73	...	...	S.E.	S.	71·6	73·	72·3	·774	·810	·792	89	72	80·5	3	5	0	C	C	B	.05
25	77	76	76·5	84	73	11	149	65	...	...	S.E.	S.E.	73·6	72·6	73·1	·829	·801	·815	89	89	89	2	10	3	B	R	C	.32
26	74	84	79	86	71	15	144	58	...	...	S.E.	S.E.	72·3	74·	73·1	·793	·840	·816	94	72	83.	5	0	3	C	B	C	1.39
27	72	83	78	86	71	15	148	62	...	...	S.E.	E.	69·5	73·	71·2	·722	·810	·766	89	72	80·5	5	3	3	C	C	C	
28	79	86	82·5	86	70	16	157	71	...	...	S.E.	S.E.	72·3	76·6	74·4	·793	·916	·854	80	90	85	0	0	0	B	B	B	
29	79	87	83	88	73	15	155	67	...	...	S.E.	S.	73·9	73·9	73·9	·839	.837	.838	85	65	75	0	0	0	B	B	B	
30	83	87	85	87	72	15	146	59	...	...	S.E.	S.W.	73·	73·9	73·4	.810	837	·823	72	65	68·5	0	0	0	B	B	B	
31	75	84	79·5	86	71	15	156	70	...	...	S.E,	S.E.	64·7	69·1	66·9	·612	.710	.661	70	60	65	3	0	0	C	B	B	

Total 9·62

STATE SURGEON'S OFFICE,
SEREMBAN, 11*th September*, 1905.

R. VAN GEYZEL,
Apothecary.

No. 11.] NOVEMBER, 1905. [Vol. IV.

AGRICULTURAL BULLETIN
OF THE
STRAITS
AND
FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,
Director of Botanic Gardens, S. S.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.

AGRICULTURAL BULLETIN
OF THE
STRAITS
AND
FEDERATED MALAY STATES.

No. 11.] NOVEMBER, 1905. [Vol. IV.

A BARK FUNGUS ON PARA RUBBER.

In the Agricultural Bulletin Vol. III p. 173, a fungus from Para-rubber trees in Sandakan was described. This fungus takes the form of a pinkish white mass, coating the bark irregularly, so as to have an appearance often of hieroglyphics. Attacking usually the upper branches or occasionally the stem it quite destroys the bark and causes the death of the wood beneath. Fortunately it is easy to see from its conspicuous whitish color, and easily dealt with by destroying infected branches, and in the case of the trunk being affected by scraping it off and treating with copper sulphate and lime.

Hitherto there has been no record of it in the Peninsula but Mr. R. BURGESS sends a stick covered with it from Sungei Siput in Perak. He writes that he has seen a few trees suffering from it on Plang Estate. It attacks the upper branches of the tree which die if not attended to. The Manager, Mr. PHILIPS, says that a mixture of Lime and Copper sulphate appears to kill the growth of the fungus and many trees have been saved thereby. It is by no means wide spread, appearing only occasionally on a few trees, and no serious damage is done; any branches found to be affected are immediately cut off and burned. The tree from which the specimen was taken is about 3 years old, planted ten by ten on the side of a hill with coffee interplanted at the same distance looking perfectly healthy and showing excellent growth.

The close planting in this case confirms my suggestion made previously that this is really the cause of the development of the plant a somewhat similar pest occurring on bushes of Strobilanthes and Ramie in wet weather chiefly when overcrowded and is another reason for planting further apart if any additional reason were wanted. The treatment adopted by Mr. BURGESS is the best possible under the circumstances and by means of this system it should not be difficult to prevent this fungus from becoming seriously injurious, but planters must of course keep an eye on any appearance of the plant and treat it promptly. In tall trees it may be difficult to detect if it appears high up, but its colour makes it pretty easy to see at some distance, so that it need not be allowed to make headway in the Estate.—*Editor.*

REPORT ON THE EXPERIMENTAL TAPPING OF PARA RUBBER TREES IN THE BOTANIC GARDENS, SINGAPORE, FOR THE YEAR 1904.

This report has been somewhat delayed for the reason that of all the rubber obtained in 1904 the sales took place in 1905, and only by the last mail, October 28th, 1905, was the result of the last sale received.

THE SEASON'S WORK.

For the year 1904 a sum of $1,200 was voted by the Legislative Council at Singapore for the experimental tapping of the rubber trees at the Botanic Gardens. Altogether 880 trees were tapped; these were arranged in 84 groups, and 884½ * lbs. of dry rubber obtained. This was sent home in four lots for sale and realized a sum of $2,440, against an expenditure of $1,200.

The highest price obtained was 6/9¼, a price at which very few other parcels sold, and for the last lot reported by the mail of 28th October, 1905, Messrs. Hecht, Levis and Khan of 36 Fenchurch Street, write "As you will see from the account sales we obtained for the thin biscuits 6/3½ per lb. which was the highest price paid at the time for the finest Ceylon "biscuits." All the rubber was prepared in the form of "biscuits" and dried with the aid of Calcium chloride.

THE GENERAL PLAN.

As this has been the largest experiment yet attempted in the Colony or the Federated Malay States a summary of the work performed may be of general interest, but we must explain that while we are aware that figures dealing with trees starting at 5 or 6 years old and onwards would be most interesting such material was not at hand at the time. It is best to state here that the garden trees comprise the first Para trees† brought to the Straits and from these original trees all the trees within the Singapore gardens have been raised. These were planted at varying distances on the only land available, a low-lying swamp, partly old

---

* Including scrap, and some rubber intended for the Government Analyst, but prepared too soon.

† This report refers to Para Rubber only, *i.e.* Hevea braziliensis.

Para rubber trees, Botanic Gardens, Singapore.

indigo ground and partly old vegetable gardens which had become overgrown with scrub. Several vacancies have occurred and on the other hand many seedlings have crept in, but taking the lot as a whole (excepting the original trees) they may be said to be from 19 to 20 years old, although from close planting and natural seedlings which have helped to pack the ground, many of the inside trees have remained almost stationary in growth for some years. Under these circumstances we have endeavoured to illustrate the yield of trees by a convenient unit of standard which shows the ratio of yield to every inch of girth as measured at 3 feet from the ground. As a matter of fact, the yield per acre for a stated age, although a natural question, is a difficult one. Trees of the same age vary considerably and depend on many conditions. The material point is :—What is the average girth? then the yield can be calculated fairly approximately.

It should be further stated that these experiments are likely to be continued over several years and many points not touched on in this report have not been overlooked but crowded out in the first year's work.

At the outset, a census of nearly all the trees of or about bearing age was made and altogether 1,285 trees were registered, showing age, girth at 3 feet from ground, whether previously tapped or not, and description of habit of the tree. This register is now important as shewing the annual increment of growth, and the result of annual tappings of the same trees.

From the register, groups of trees were selected according to girth—from 1 ft. 6 in. to 5 or 6 ft., these were arranged into groups, and tapped by different methods and intervals during several months of the year, and the results recorded. Trial tappings were made in the months of March, April, May and June but we were not satisfied with the consistency or flow of latex and a definite start was deferred until July.

The arrangement of the different groups for experiment, methods and periods of tapping, dry rubber obtained, and other details, are best shewn in the following summarized tabulated statements, details of which have been already published in the *Agricultural Bulletin, S.S. and F.M.S.*, for September and November, 1904, and April and May, 1905, (*see* *Appendices *A. B., C.* and *D.*). We pause to mention that in these experiments, the comparative yield only, by different methods of tapping, was attempted and not the maximum yield.

---

* Not printed.

EXPERIMENT *I.*

Working Number.	Group.	Aggregate girth at 3 ft. from ground.		No. of Trees Tapped.	Mode of Tapping.	Times Tapped.	Dry Rubber.				Total Yield.		Comparative yield per inch of girth.	Interval of Tapping.	Remarks.
							Morning.		Evening.						
		Ft.	In.				lbs.	zs.	lbs.	ozs.	lbs.	ozs.			
I.		11	4½	5	Oblique Reversed.	15	1	12½					Under ¼ oz.	Daily	Rainfall during period of Tapping Inches 2 parts 28.
II.		13	11½	5	Long Oblique.	15	2	11¾					Over ¼oz.	excepting	
III.		16	3	5	Oblique Reversed.	15	3	11¼					Over ¼ oz	Sundays.	
IV.		18	8½	5	Long Oblique.	15	2	8¼					Under ¼oz.	...	
V.		21	0¾	5	Single Incisions.	15	8	3			18	14¾	Over ½ oz.	...	81 ft. 4¼ ins.
I.			4¾	5	Oblique Reversed.	15			1	3¾			Under ¼ oz.	...	
II.		13	5¼	5	Long Oblique.	15			2	4			Under ¼ oz.	...	Period July.
III		17	11¼	5	Long Oblique.	15			3	2½			Under ¼ oz.	...	
IV.		22	9½	5	Single Incisions.	15			6	4¼			Over ¼ oz.	...	
V.		28	9½	5	Single Incisions.	15			5	13¾	18	12¼	Over ¼ oz.	...	92 ft. 4¼ ins.

EXPERIMENT *II.*

Working Number.	Group.	Aggregate girth at 3 ft. from ground.		No. of Trees Tapped.	Mode of Tapping.	Times Tapped.	DRY RUBBER.				Total Yield.		Comparative yield per inch of girth.	Interval of Tapping.	REMARKS.
							Morning.		Evening.						
		Ft.	in.				lbs.	ozs.	lbs.	ozs.	lbs.	ozs.			
I.	I	28	3¾	10	Long Oblique.	16	8	9½					Under ½ oz.	Alternate Days.	
	II	27	8¾	10	„	16	8	11¼					„	„	
II.		26	7¾	10	„	18	8	11½					„	Daily.	
III.		33	4¼	10	„	18	11	6¾					„	„	
IV.		32	3½	10	Single Incisions.	14	6	4¾					Over ¼ oz.	„	
V.		32	4¾	10	Herring Bone.	18	10	8			54	3¾	Under ½ oz.	„	180 ft. 8¾ in.
I.	I	27	4½	10	Long Oblique.	16			9	1¼			„	Alternate Days.	
	II	27	9¼	10	„	16			9	6¾			„	„	
II.		27	5¾	10	„	18			7	12¾			„	Daily.	Period July and August
III.		29	8	10	„	18			6	14			Over ¼ oz.	„	
IV.		32	10¼	10	Single Incisions.	14			7	3¼			„	„	
V.		32	6¼	10	Herring Bone.	18			8	15	49	5	„	„	177 ft. 8 in.

EXPERIMENT *III.*

Working Number.	Group.	Aggregate girth at 3 ft. from ground.		No. of Trees Tapped.	Mode of Tapping.	Times Tapped.	DRY RUBBER.				Total Yield.		Comparative yield per inch of girth.	Interval of Tapping.	REMARKS.
							Morning.		Evening.						
		Ft.	In.				lbs.	ozs.	lbs.	ozs.	lbs.	ozs.			
II	I	17	8	10	Long Oblique	15	4	00¼					Over ¼ oz.	Alternate Days	
	II	17	9¾	10	,,	15	4	9¼					,,	,,	
IV		36	0¼	20	Single Incisions	23	6	4¾					Under ¼ oz.	Daily	Period.
III		31	9¾	10	Herring Bone	18	6	2½					Over ¼ oz.	,,	August and Sept.
V	I	32	1¾	10	,,	15	9	3					Under ½ oz.	Alternate	
	II	33	6½	10	,,	15	10	1½			40	5¼	,,	,,	169 ft. 0 in.
V	I	31	9½	10	,,	15			9	13¼			,,	,,	
	II	32	8¾	10	,,	15			7	14¾			Over ¼ oz.	,,	
II	I	17	1¼	10	Long Oblique	15			3	10			,,	,,	
	II	16	11½	10	,,	14			3	8½			,,	,,	
IV		33	9	20	Single Incisions	23			5	1¾			Under ¼ oz.	Daily	
III		32	0¼	10	Herring Bone	18			7	9¾	37	10	Over ¼ oz.	,,	164 ft. 4¼ in.

EXPERIMENT *IV*.

Working Number.	Group.	Aggregate girth at 3 ft. from ground.		No. of Trees Tapped.	Mode of Tapping.	Times Tapped.	Dry Rubber.				Total Yield.		Comparative yield per inch of girth.	Interval of Tapping.	Remarks.
							Morning.		Evening.						
		Ft.	In.				lbs.	ozs.	lbs.	ozs.	lbs.	ozs.			
					Herring Bone										
I	I	22	8¾	10	,,	18	5	4					Over ¼ oz.	Daily	
	II	23	0¾	10	,,	18	4	3¼					Under ¼ oz.	,,	
III	I	22	9¾	10	,,	18	4	0½					Under ¼ oz.	Alternate	
	II	23	2¾	10	,,	18	4	10½					Over ¼ oz.	,,	Period September, October and November.
V	I	32	5	10	,,	18	8	9					Over ¼ oz.	,,	
	II	32	11¾	10	,,	18	9	13					Under ½ oz.	,,	
II	I	37	2	10	,,	18	14	14					Over ½ oz.	,,	
	II	37	11½	10	,,	18	14	12¼					Over ½ oz.	,,	
IV	I	41	11¼	10	,,	18	14	15¼					Under ½ oz.	Daily	
	II	41	8	10	,,	18	10	6¾			91	8½			315 ft. 11½ in.
I	I	22	10	10	,,	18			4	13¼			Over ¼ oz.	Daily	
	II	22	9½	10	,,	18			4	2¾			Under ¼ oz.	,,	
III	I	23	4¼	10	,,	18			4	5			Under ¼ oz.	Alternate	
	II	22	1¾	10	,,	18			4	7½			Over ¼ oz.	,,	
V	I	31	9	10	,,	18			7	8			Over ¼ oz.	,,	
	II	32	3¾	10	,,	18			6	7			Over ¼ oz.	,,	
II	I	37	7½	10	,,	18			8	9			Over ¼ oz.	,,	
	I	38	1½	10	,,	18			11	7½			Under ½ oz.	,,	
IV	I	42	8¾	10	,,	18			10	6¾			Over ¼ oz.	Daily	
	II	42	2½	10	,,	18			9	10¾	71	13½	Over ¼ oz.	,,	315 ft. 10½ in.

EXPERIMENT V.

Working Number.	Group.	Aggregate girth at 3 ft. from ground.		No. of Trees Tapped.	Mode of Tapping.	Times Tapped.	Dry Rubber.				Total yield.		Comparative Yield per inch of Girth.	Interval of Tapping.	Remarks.
							Morning.		Evening						
		Ft.	in.				lbs.	ozs.	lbs.	ozs.					
I.	I	17	9	10	Herring Bone.	15	2	14					Under ¼ oz	Alternate days	
	II	17	3½	10	,,	15	2	14¼					Under ¼ oz.	,,	
II.	I	22	3	10	,,	17	4	12½					Over ¼ oz.	,,	
	II	22	10	10	,,	17	5	12¾					Over ¼ oz.	,,	
III.	I	27	6¼	10	,,	19	9	4½					Under ½ oz.	,,	Period.
	II	27	3	10	,,	19	7	12¾					Under ½ oz.	,,	Nov. and Dec.
IV.	I	37	10	10	,,	24	16	2¼					Over ½ oz.	,,	
	II	37	4½	10	,,	24	17	5½					Over ½ oz.	,,	
V.	I	47	3¾	10	,,	24	21	12½					Over ½ oz.	,,	
	II	47	5¾	10	,,	24	20	15½			109	10½	Over ½ oz.	,,	304 ft. 10¾ in.
I.	I	17	3½	10	,,	15			3	4¾			Over ¼ oz.	,,	
	II	18	5	10	,,	15			2	8			Under ¼ oz.	,,	
II.	I	23	10¾	10	,,	17			2	15¼			Under ¼ oz.	,,	
	II	22	8¼	10	,,	17			2	14½			Under ¼ oz.	,,	
III.	I	26	10¼	10	,,	19			6	4¾			Over ¼ oz.	,,	
	II	26	6½	10	,,	19			4	14½			Under ¼ oz.	,,	
IV.	I	37	1¾	10	,,	24			14	13½			Over ½ oz.	,,	
	II	36	9½	10	,,	24			15	¼			Over ½ oz.	,,	
V.	I	46	10½	10	,,	24			17	5¾			Over ½ oz.	,,	
	II	46	8	10	,,	24			15	12¾	85	14	Under ½ oz.	,,	303 ft. 2 in.

EXPERIMENT *VI.*

Working Number.	Group.	Aggregate girth at 3 ft. from ground.		No. of Trees Tapped.	Mode of Tapping.	Times Tapped.	Dry Rubber.				Total Yield.		Comparative yield per inch of girth.	Interval of Tapping.	Remarks.
							Morning.		Evening.						
		ft.	in.				lbs.	ozs.	lbs.	ozs.	lbs.	ozs.			
I.		56	9	15	Herring Bone.	22	15	6¼					Over ¼ oz.	Daily	
II.		56	3	15	,,	21	20	7¼					Over ½ oz.	Daily	Period December and January.
III.		60	9½	15	,,	21	17	4¾					Under ½ oz.	Daily	
IV.		74	6	15	,,	23	24	5					Under ½ oz.	Alternate Days	
V.		85	7	15	,,	28	33	8			110	15¼	Over ½ oz.	Daily	333 ft. 10½ in.
I.		57	10	15	,,	22			12	14			Over ¼ oz.	Daily	
II.		55	8¾	15	,,	21			16	15½			Under ½ oz.	Daily	
III.		64	7¼	15	,,	21			16	15			Over ¼ oz.	Daily	
IV.		71	10½	15	,,	23			25	4¼			Under ½ oz.	Alternate Days	
V.		81	1½	15	,,	28			27	1¾	99	2½	Under ½ oz.	Daily	331 ft. 2 in.

METHODS OF TAPPING.

We are aware that methods which at the time of writing are obsolete were considered the best at the time of tapping; a much favoured one being the Single Incision whose votaries claimed for it a maximum yield combined with simplicity of operation and other advantages. It was tried on different sized trees at different periods but only one result compares favourably with other methods which read as follows:—

Mode of Incision.	Aggregate girth at 3 ft. from ground.	Number of trees tapped.	Times tapped.	Total dry Rubber obtained.		Average yield per tree.		Interval of Tapping.
				lbs.	ozs.	lbs.	ozs.	
Single Incision.	21′ 0¾″	5	15	8	3	1	7	Daily.
Herring Bone ...	37′ 2½″	10	18	14	14	1	8	Alternate days.
Do. ...	37 11¼″	10	18	14	12¼	1	7½	Do.
Do. ...	37 10″	10	24	16	2¼	1	9	Do.
Do. ...	37 4½″	10	24	17	5½	1	11	Do.
Do. ...	47 3¾″	10	24	21	12¼	2	2	Do.
Do. ...	85 7″	15	28	33	8	2	10	Daily.

The single incision is a quick method but the yield of dry rubber 1 lb. 7 ozs. per tree was the maximum for the year (without removing an extravagant amount of bark) while by any of the other methods tried double the quantity night have been obtained by another period of tapping; again, with the single incision, the trees do not recover well, and the bark is made difficult for any other method of tapping, and with us the system has dropped out.

All other methods of tapping differ from single incisions in the flow of latex, in the latter the flow is fairly uniform and the last tapping may be as much, if not the most, of any. In other methods the flow reaches a maximum yield about the 9th tapping which may be more or less maintained for 7 or 8 more tappings and then diminishes. In Experiment *I* trials were made with a modified herring-bone method with a view of ascertaining if the centre channel could be disposed of, as this being a vertical incision the wound does not heal well and shews a channelled depression for a much longer period than do oblique ncisions. Long

Two forms of Tapping.

oblique incisions were opened at about an angle of 45°, and reversed oblique incisions at an angle of 135°, much resembling an inverted V, this latter trial came out poorly and was not continued in Experiment *II* or Experiment *III*.

In these the single, long oblique, and herring-bone methods were tried, daily and alternate days. The best result obtained with the long oblique being under half an ounce of dry rubber to the inch of girth, and as there is the additional work of using 10 cups to each tree, while one suffices in the herring-bone method, an extended trial of the herring-bone was made in Experiment *IV*.

In this trial one group exceeded half an ounce of dry rubber to the inch and favoured tapping on alternate days which was more fully tested in Experiment *V* when 7 groups exceeded half an ounce of rubber to the inch, and excepting 4 groups of small, stationary, inside trees, the general result was good.

Experiment *VI* was a continuation of the previous trial but on big trees and shows that when we are working on a more developed system of periodical tappings some big averages will be obtained. The yield of group 5 morning, Experiment 6, is particularly interesting, *see* Appendix *D*, page 148, this group averaged 2 lbs. 10 ozs. per tree and was continued for 28 tappings, the 13th tapping giving 30 ozs. of dry rubber, and the 28th tapping, 24¼ ozs.

COAGULATION OF THE LATEX.

By the use of a weak solution of formalin we were not much troubled with "Scrap" or rubber which had coagulated within the collecting cups, (although the same remark, under the same conditions, does not apply for the current year.) A practically air-tight chamber capable of drying 300 lbs. of rubber with the aid of Calcium chloride was built during the year but the materials, bricks, cement, etc., were not sufficiently dry for use in the year under review (but it is at the time of writing working successfully) and all the rubber in the from of "biscuit" was prepared in almeirahs and cabinets, the drying being assisted by Calcium Chloride.

THE EXPERIMENTS REVIEWED.

Undoubtedly striking is the difference in favour of morning over evening tappings as already noticed in the appendices, and is due to the pressure of moisture in the mornings by absorption during the night, and the difference on evenings to the excessive evaporation during the day; in fact, with a tree of 3 feet girth at 6 A.M. we have found a contraction on a bright sunny day exceeding a quarter of an inch by mid-day, and at 5 P.M. the same tree had not reached early morning measurement. Evening tappings to be successful should be deferred as late in the day as possible and on well laid out estates might be managed with artificial light. On rainy cloudy days the trees are swollen to tension point and the flow of latex excessive but the increase of water is too evident.

Another point of interest, so far as these experiments go, is in favour of tappings during November, December, and January which may or may not be quite natural. If the lactiferous system of a Para Rubber tree has no other function than that of sealing wounds, why there should be an increment of yield during these months is not evident, but if some reserve material necessary for the fruiting season which immediately follows is called upon, the increase of latex may be quite natural.

This brings us to the point that in a natural state, *i.e.*, with trees which have not been regularlY tapped, some months are more favourable for tapping than others, and the same remark applies to the growth of new bark. Trees tapped late or early in the year are the slowest to recover. The resting period, when the tree is deciduous, or partly so, usually commences in February, and from then until the end of June when the fruit commences ripening, we have not been satisfied with tapping trials; but we digress to point out that while young trees are uniform in their flowering periods, older trees become variable and it is quite common to see one half of a tree deciduous or wintering while the other half is verdant green. This may account for some of the vagaries of the tree, of which few other trees represent so many. Indeed, with this species it is difficult to establish any point without an exception. It is therefore possible that periodical tappings would even bridge over these dormant months for we know that, up to date, the same trees tapped this year as last at the Botanic Gardens shew an increment of about 45% for the reason that we suppose, the trees had been previously tapped and are singularly responsive on further tapping.

A further point of interest as shewn by these experiments is the ratio of yield to the size of the tree, here however we except the age of the trees, which in respect of size vary from under 2 feet to over 6 feet in girth. Following what has been already stated that these experiments do not go beyond the compartive yield by different methods we find the following table may be drawn up :—

GIRTH AT 3 FEET FROM GROUND.	COMPARATIVE YIELD PER INCH OF GIRTH AT 3 FEET FROM GROUND.
Under 2 ft. girth	Under ¼ oz.
From 2 ft. to 2 ft. 6 inches ...	¼ oz.
From 2 ft. 6 ins. to 3 ft. ...	Under ½ oz.
From 3 ft. to 3 ft. 6 ins. ...	½ oz.
From 3 ft. 6 ins. and over ...	Over ½ oz.

Here we are face to face with the drawback of close planting. This will be best illustrated by quoting from the Register of Trees and shewing the very small increment of growth for 12 months with trees which had been too closely planted (see numbers 100 to 173) and comparing these with a single line and other trees well distanced as shewing a satisfactory increment of growth for the year (see numbers 1212 to 1285). In the first lot of trees, or closely planted ones, the trees were "spokeshaved" or roughly cleaned for tapping before being measured, and for a tree with deep corrugated bark due allowance must be made. Only a few of the second lot of trees, or open planted ones, had been tapped but this point need not be considered as trees well distanced shew a satisfactory increment of growth whether tapped or not.

CLOSE PLANTING.

Registered Number of Tree.	Date of Measurement 1904.	Girth at 3 ft. from ground.		1905 Date of Measurement.	1905.		Increment for 1 year.	
		ft.	in.		ft.	in.	ft.	in.
100	5-5-04	2	1	8-5-05	2	1⅜		⅜
101	,,	1	7	8-5-05	1	7¾		¾
102	,,	2	5	9-5-05	2	5½		½
103	,,	3	5¼	,,	3	6½		1¼
104	,,	4	0½	,,	4	1		½
105	,,	3	3	,,	3	4⅛		1⅛
106	,,	3	2¼	,,	3	4⅜		2⅛
107	,,	2	10¼	,,	2	11		¾
108	,,	1	7	,,	1	7		Nil
109	,,	1	9¾	,,	1	10		¼
110	,,	3	0	,,	3	0		Nil.
111	,,	3	7½	,,	3	10		2½
112	6-5-04	3	11	,,	3	11½		½
113	,,	3	6	,,	3	6		Nil
114	,,	2	9½	,,	2	9½		Nil
115	,,	2	3¼	,,	2	3⅝		⅜
116	,,	3	6	,,	3	8⅜		2⅜
117	,,	2	6¾	,,	2	8		2¾
118	,,	4	0	,,	4	1⅜		1⅜
119	,,	3	1¼	,,	3	2½		1¼
120	,,	2	5¾	,,	2	6⅝		⅞
121	,,	3	1	,,	3	1		Nil
122	,,	3	10¼	,,	3	11		¾
123		2	11½	,,	2	11⅞		⅜
124		2	1¼	,,	2	1¼		Nil
125	,,	2	9	,,	2	9½		½
	,,	3	1¼	,,	3	2¼		1
127	,,	4	7½	,,	4	7½		Nil

CLOSE PLANTING.

Registered Number of Tree.	Date of Measurement 1904.	Girth at 3 ft. from ground.		1905 Date of Measurement.	1905.		Increment for 1 year.	
		ft.	in.		ft.	in.	ft.	in.
128	6-5-04	2	10½	9-5-05	2	11⅛		⅝
129	,,	1	5¼	,,	1	6¼		1
130	,,	3	2¾	,,	3	3¼		½
131	,,	3	1	,,	3	1¾		¾
132	,,	2	9¾	,,	2	9¾		Nil
133	,,	4	2	,,	4	2		Nil
134	,,	1	10	,,	1	10⅛		⅛
135	,,	3	5½	,,	3	5⅞		⅜
136	,,	1	8¾	,,	1	8⅞		⅛
137	,,	2	7	,,	2	7⅛		⅛
138	,,	3	10¼	,,	3	10¼		Nil
139	,,	2	11½	,,	2	11½		Nil
140	,,	2	2¾	,,	2	3½		¾
141	,,	2	6¾	,,	2	6⅞		⅛
142	,,	3	6¼	,,	3	6½		¼
143	,,	3	10	,,	3	10		Nil
144	,,	2	2¼	,,	2	2¼		Nil
145	,,	2	10½	,,	2	11		½
146	,,	2	9½	,,	2	10¼		¾
147	,,	2	5	,,	2	6⅛		1⅛
148	,,	3	3	,,	3	4		1
149	,,	3	3	,,	3	3½		½
150	,,	2	3½	,,	2	4⅛		⅝
151	,,	2	7½	,,	2	7½		Nil
152	,,	2	6½	,,	2	7¼		¾
153	,,	3	5¼	,,	3	7½		2¼
154	,,	4	2	,,	4	2¼		¼
155	,,	2	3	,,	2	3½		½

CLOSE PLANTING.

Registered Number of Tree.	Date of Measurement 1904.	Girth at 3 ft. from ground.		1905. Date of Measurement.	1905.		Increment for 1 year.
		ft.	in.		ft.	in.	
156	6-5-04	2	8½	9-5-05	2	9¾	1¼
157	„	1	7¼	„	1	8	½
158	„	3	7¾	„	3	7¾	½
159	„	3	10½	„	3	10½	Nil
160	„	2	5¼	„	2	5⅝	⅜
161	„	3	6½	„	3	10	3½
162	„	3	6	„	3	6¾	¾
163	„	2	5½	„	2	6¾	1¼
164	„	2	1	„	2	1	Nil
165	„	3	3¾	„	3	4	¼
166	„	2	9¼	„	2	9¼	Nil
167	„	2	4¼	„	2	4¼	Nil
168	„	2	5¾	„	2	5¾	Nil
169	„	2	9	„	2	9¾	¾
170	„	1	9	„	1	9	Nil
171	„	2	10	„	2	10⅝	⅝
172	„	3	5¾	„	3	5¾	Nil
173	„	3	11¾	„	4	0	¼

OPEN PLANTING.

Registered number of Tree.	Date of measurement 1904.	Girth at 3 ft. from ground.		Date of measurement 1905.	1905		Increment of growth.	
		Ft.	In.	22-6-05	Ft.	In.	Ft.	In.
1212	22-6·04	4	2⅛	23-6-05	4	6⅛	...	4
1213	23-6-04	2	10	,,	2	11½	...	1½
1214	,,	3	0⅞	,,	3	4¾	...	3½
1215	,,	4	2½	,,	4	4	...	1½
1216	,,	3	6	,,	3	9¼	...	3¼
1217	,,	2	4⅛	,,	2	10⅛	...	6
1218	,,	1	5⅞	,,	1	10	...	4⅛
1219	,,	1	7½	,,	2	2	...	4½
1220	,,	1	9	,,	2	1⅞	...	4⅞
1221	,,	2	10⅝	,,	3	3⅜	...	4⅜
1222	,,	1	5⅝	,,	1	9½	...	3⅝
1223	,,	1	11⅛	,,	2	3¼	...	4⅛
1224	,,	1	6⅝	,,	1	11½	...	4⅝
1225	,,	1	9¾	,,	2	3¼	...	5½
	,,	1	4⅝	,,	1	8¼	...	3½
	,,	1	7⅛	,,	2	0	...	4⅞
1226	,,	1	11⅞	,,	2	4⅜	...	4½
1227	,,	1	9⅞	,,	2	2⅜	...	4½
1228	,,	2	7	,,	3	2½	...	6½
1229	,,	2	1	,,	2	4⅝	..	3⅝
1230	,,	1	8⅜	,,	2	0¾	...	4⅜
1231	,,	2	1¼	,,	2	4¾	...	3½
1232	,,	1	2⅞	,,	1	6⅜	...	3½
1233	,,	2	2½	,,	2	9½	...	7
1234	,,	1	10¾	,,	2	2⅝	...	3⅞
1235	,,	1	10½	,,	2	3⅛	...	4⅝
1236	,,	2	5⅛	,,	2	7¾	...	2⅝
1237	,,	1	5	,,	1	6⅞	...	1⅞
1238	,,	1	9⅝	,,	2	2	...	4⅜

OPEN PLANTING.

Registered number of Tree.	Date of Measurement 1904.	Girth at 3 ft. from ground.		Date of Measurement 1905.	1905.		Increment of growth.	
	23-6-04	ft.	in.	23-6-0	ft.	in.	ft.	in.
1239	,,	1	8¼	,,	2	0½		4¼
1240	,,	1	8	,,	1	10¾		2¾
1241	,,	1	4	,,	1	6½		2½
1242	,,	1	5	,,	1	7⅞		2⅞
1243	,,	1	5⅝	,,	1	8⅜		3¼
1244	,,	1	11	,,	2	1		2
1245	,,	1	6½	,,	1	10		3½
1246	,,	1	6¼	,,	1	7⅝		1⅜
1247	,,	1	10¼	,,	2	1¼		3
1248	,,	1	2¼	,,	1	5⅜		3⅛
1249	,,	1	4	,,	1	7⅞		3⅞
1250	,,	1	7⅛	,,	1	11		3⅞
1251	,,	1	7	,,	1	9¾		2¾
1252	,,	1	7⅛	,,	1	11⅛		4
1253	,,	1	8¼	,,	1	11⅛		2¾
1254	,,	1	9	,,	2	1		4
1255	,,	2	2⅞	,,	2	5⅝		2¾
1256	,,	3	9⅞	,,	4	0		2⅛
1257	,,	2	6	,,	2	9⅝		3⅝
1258	,,	2	6¾	,,	2	9¾		3
1259	,,	2	7	,,	2	11⅝		4⅝
1260	,,	2	4⅝	,,	2	4⅝		Nil.
1261	,,	2	8¾	,,	3	1		4¼
1262	,,	2	7⅝	,,	2	10¾		3⅛
1263	,,	3	9⅛	,,	4	0½		3⅝
1264	,,	2	6¾		2	7⅝		⅞
1265	,,	2	11¼	,,	3	3⅝		4⅜
1266	,,	2	0¾	,,	2	3⅛		2⅜

OPEN PLANTING.

Registered Number of Tree.	Date of Measurement 1904.	Girth at 3 ft. from ground.		Date of Measurement 1905.	Girth at 3 ft. from ground.		Increment of growth.	
	23-6-04	ft.	in.	23-6-05	ft.	in.	ft.	in.
1267	,,	1	9⅜	,,	1	11		1⅝
1268	,,	1	5	,,	1	7¼		2¼
1269	,,	1	5	,,	1	6⅝		1⅝
1270	,,	1	7½	,,	1	9⅜		2¼
1271	,,	1	11½	,,	2	2⅛		2⅝
1272	,,	3	2½	,,	3	4½		2
1273	,,	2	7	,,	2	8		1
1274	,,	1	8¼	,,	1	9½		1¼
1275	,,	2	0	,,	2	0½		½
1276	,,	4	5¾	,,	4	9⅞		4⅛
1277	,,	5	0½	,,	5	2⅞		2⅜
1278	,,	2	10	,,	2	11		1
1279	,,	2	10¼	,,	3	0½		2¼
1280	,,	2	9½	,,	3	0⅞		3⅜
1281	,,	5	2⅜	,,	5	8⅛		5¾
1282	,,	1	10¼	,,	1	10¾		½
1283	,,	2	8⅞	,,	3	0⅞		4
1284	,,	4	0⅞	,,	4	6⅞		6
1285	,,	3	8¼	,,	4	0½		4¼

The ratio of growth all trees varies at different periods, with the Para rubber tree the best growing period is undoubtedly between the 6th and 15th years during which time trees may increase from about 24 inches in girth to 60 inches or more, thus shewing an annual increment of growth from 3-6 inches. We have shown that trees closely planted do not make a satisfactory increment of growth, and that the yield of rubber increases with the size of the tree from under ¼ oz. of dry rubber to the inch of girth for small trees, to over ½ oz. for large ones and to further emphasise the fact and the error of close planting we submit the following statements taken from the figures of the experiments :—

NUMBER OF TREES TAPPED.	AVERAGE GIRTH PER TREE.	AGGREGATE GIRTH.	DRY RUBBER.	REMARKS.
	Ft. in.	Ft. in.	Lbs. ozs.	
40	2 3	90 7½	18 7¼	Tapped 18 times.
20	4 2	83 7¼	25 6	,, ,, ,,
50	1 9	88 7¼	18 8¼	
15	5 8	85 7	33 8	

This we think conclusive, and that the first object of every Para rubber cultivator should be to aim at well developed trees, and this can only be attained with trees which have been well distanced from the time of planting, for as soon as the roots touch and become intermatted the growth of the tree is impaired. We also think that whatever be the methods of tappings—whether those now in vogue, or those to come—the result can only be safe when the annual increment of growth is up to standard as is shewn by the figures quoted.

There is still a further objection to close planting by the reason of the probability of the spread of fungoid disease. We do not now enter into all the different pests and diseases of Para rubber which are familiar to readers of the Agricultural Bulletin but none of which need be regarded seriously excepting the fungus (Fomes semitostus) this if once established might prove very serious on estates closely planted, for the roots already intermatted remain and the fungus is not apparent until a tree drops.

The thread-like mycelium is exclusively underground and when well developed some fruits may appear at the base of a tree but the tree is then doomed and past recovery. Only one thing can be done, to clear a sufficiently large area and isolate the ground which should be kept treated with quick-lime and sulphate of copper. This treatment where it can be applied will kill the fungus but the difficulty is to find the fungus before any damage is done.

CATCH CROPS.

We are led to believe that catch crops are not favourably considered by many planters; we would ask if Para trees are planted closely and are to be cut out when the ground is over grown how such trees are to be regarded; if not a catch crop what is it? As a matter of fact it is a catch crop, and, in all the circumstances, a very bad one. We think certain catch crops, with ground carrying trees well distanced would be beneficial, some monocotyledonous plants, plantains, pineapples, Sanseviera, Furcraea particularly, and other fibre plants would not be harmful—as a means of safeguarding the crop while paying their way—some leguminous crops such as ground nuts for one or two crops which would give the soil activity and "tilth" are more rational than some utopian ideas of root pruning which have reached us.

MANURING PARA TREES.

Manuring young trees with different manures has been referred to in the Agricultural Bulletin Vol. III. p. 405, and other numbers. During the year 50 old trees were heavily manured with Cow manure and although the Para rubber tree is essentially a surface feeder we did not find that the manure had any effect either in increment of growth or increase of yield but we observed that by sweeping all fallen leaves and fruit capsules around the base of trees a rich "humus" is accumulated which at least serves one good purpose in feeding and retaining a network of active surface roots.

CONCLUSION.

Much remains to be done in connection with rubber. Improved methods of tapping will naturally evolve. The great problem however, is to bring the dried rubber produced in the Straits up to the Standard of best Para and the difficulty we suspect is the same as in the case of gambir or copra and lies in combating the excessive humidity of the country. Washed rubber no doubt is an economical and expeditious method but we fail to see that any improvement in the texture of the rubber is likely to result in the future over the present by this process. So far little could be done in this direction as unfortunately the market does not assist experimental work and only recognizes one class of rubber and prices are high or low as the rubber compares or approaches the approved class. Now however as the Government Analyst will be prepared to test samples experiments will also be made in different methods of drying.

HENRY N. RIDLEY.
R. DERRY.

7th November, 1905.

REGISTER OF RAINFALL AT NEGRI SEMBILAN HOSPITALS. FOR OCTOBER, 1905.

Date.	Seremban.		K. Pilah.		Tampin.		Jelebu.		Port Dickson.		Mantin.	
	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.
1	...	05	...	02	...	...	...	...	...	...	...	16
2	...	22	...	...	...	60	...	80	1	21	...	08
3	...	57	...	30	2	48	...	20	1	83	1	30
4	2	70	...	14	...	15	...	03	...	49	...	67
5	...	...	...	...	...	23	...	...	...	...	...	...
6	...	44	...	85	...	46	...	43	...	...	...	04
7	...	93	...	04	...	22	...	47	...	...	...	54
8	...	20	2	56	...	22	1	05	...	10	...	48
9	...	74	...	07	...	...	...	27	...	...	...	24
10	2	91	2	00	...	73	...	80	...	...	1	24
11	...	30	...	39	...	17	...	09	...	71	...	13
12	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	02	...	...	...	02
14	...	...	...	...	...	...	...	...	...	...	...	...
15	...	34	...	17	...	01	...	05	...	05	...	61
16	...	26	...	...	...	40	...	08	...	...	...	12
17	...	...	...	07	...	...	...	...	...	28	...	...
18	...	78	...	...	1	35	...	43	...	...	...	42
19	...	...	...	41	...	...	...	...	...	31	...	...
20	...	16	...	...	...	...	...	...	...	...	...	...
21	...	08	...	21	...	50	...	03	1	27	...	08
22	...	...	...	...	...	...	...	...	...	30	...	...
23	...	...	...	44	...	...	...	...	...	...	...	...
24	...	...	...	...	...	30	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	02	...	02	...	...	...	...
27	...	...	...	...	...	...	...	02	...	14	...	13
28	...	...	...	...	...	...	...	...	...	...	...	...
29	...	26	...	...	...	50	...	...	...	...	...	...
30	...	...	...	37	...	...	...	02	1	14	...	...
31	...	...	...	...	...	05	...	...	...	30	...	...
Total	10	94	8	04	8	39	4	81	8	58	6	26

STATE SURGEON'S OFFICE,
SEREMBAN, 10*th November*, 1905.

R VAN GEYZEL,
Apothecary.

SINGAPORE MARKET REPORT.

October, 1905.

Articles.	Quantity sold.	Highest price.	Lowest price.	
	Tons.	$	$	
Coffee—Palembang	20	25.00	23.00	
Bali	5	22.50	22.50	
Liberian	55	25.00	23.00	
Copra	5,147	7.45	6.80	
Gambier	3,262	8.45	7.87½	
Cube Gambier, Nos. 1 and 2	397	12.00	11.00	
Gutta Percha, 1st quality	...	300.00	150.00	
Medium	...	200.00	90.00	
Lower	...	80.00	12.00	
Borneo Rubber 1, 2, and 3	...	135.00	90.00	
Gutta Jelutong	...	7.25	6.25	
Nutmegs, No. 110's	...	34.00	32.00	
No. 80's	...	56.50	54.00	
Mace, Banda	...	85.00	83.00	
Amboyna	...	55.00	54.00	
Pepper, Black	731	26.37½	24.75	
White (Sarawak)	535	36.37½	34.75	
Pearl Sago, Small	...	No quota	tion.	
Medium	...	,,		
Large	...	,,		
Sago Flour, No. 1	4,275	3.12½	2.70	
No. 2	342	0.90	0.75	
Flake Tapioca, Small	608	7.20	6.35	Closing fair.
Medium	...	...	...	
Pearl Tapioca, Small	229	6.20	5.80	
Medium	437	6.30	6.00	
Bullet	...	...	...	
Tin	2,725	82.00	80.00	

Export Telegram to Europe and America.

For Fortnight ending 15th October, 1905.

Wired at 4 p. m. on 16th October, 1905.

				Tons.
Tin	Str.	Singapore & Penang to	United Kingdom &/or	1,250
Do.	,,	Do.	U. S. A.	310
Do.	,,	Do.	Continent	375
Gambier	,,	Singapore	Glasgow	25
Do.	,,	Do.	London	50
Do.	,,	Do.	Liverpool	225
Do.	,,	Do.	U. K. &/or Continent	85
Cube Gambier	,,	Do.	United Kingdom	55
Black Pepper	,,	Do.	Do.	110
Do.	,,	Penang	Do.	...
White Pepper	,,	Singapore	Do.	140
Do.	,,	Penang	Do.	...
Pearl Sago	,,	Singapore	Do.	...
Sago flour	,,	Do.	London	330
Do.	,,	Do.	Liverpool	1,025
Do.	,,	Do.	Glasgow	75
Tapioca Flake	,,	Singapore & Penang	United Kingdom	130
T. Pearl & Bullets	,,	Do.	Do.	...
Tapioca Flour	,,	Penang	Do.	210
Gutta Percha	,,	Singapore	Do.	50
Buffalo Hides	,,	Do.	Do.	50
Pineapples	,,	Do.	Do.	cases 2,000
Gambier	,,	Do.	U.S.A.	cases 525
Cube Gambier	,,	Do.	Do.	75
Black Pepper	,,	Do.	Do.	55
Do.	,,	Penang	Do.	...
White Pepper	,,	Singapore	Do.	100
Do.	,,	Penang	Do.	...
T. Flake & Pearl	,,	Singapore & Penang	Do.	370
Nutmegs	,,	Do.	Do.	17
Sago Flour	,,	Singapore	Do.	250
Pineapples	,,	Do.	Do.	cases 200
Do.	,,	Do.	Continent	cases 1,000
Gambier	,,	Do.	South Continent	80
Do.	,,	Do.	North Continent	350
Cube Gambier	,,	Do.	Continent	45
Black Pepper	,,	Do.	South Continent	250
Do.	,,	Do.	North Do.	10
Do.	,,	Penang	South Do.	...
Do.	,,	Do.	North Do.	...
White Pepper	,,	Singapore	South Do.	10
Do.	,,	Do.	North Do.	80
Do.	,,	Penang	South Do.	10
Do.	,,	Do.	North Do.	...
Copra	,,	Singapore & Penang	Marseilles	200
Do.	,,	Do.	Odessa	2,850
Do.	,,	Do.	Other South Continent	680
Do.	,,	Do.	North Continent	800
Sago Flour	,,	Do.	Continent	1,200
Tapioca Flake	,,	Singapore & Penang	Do.	310
Tapioca Pearl	,,	Do.	Do.	190
Copra	,,	Singapore.	England	...

				Tons.
Gambier	Slr	Singapore	U. S. A.	...
Cube Gambier	,,	Do.	Do.	..
T. Flake and Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	...
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	...
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	..
Pineapples	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Do.	Do.	...
T. Flake and Pearl	,,	Do.	Do.	
Nutmegs	,,	Do.	Do	...

1,050 tons Gambier } Contracts
340 ,, Black Pepper }

Export Telegram to Europe and America.

For Fortnight ending 31st October, 1905.

Wired at 4.30 p. m. on 1st November, 1905.

Tin	Str.	Singapore & Penang to	United Kingdom &/or	1,125
Do.	,,	Do.	U. S. A.	630
Do.	,,	Do.	Continent	225
Gambier	,,	Singapore	Glasgow	...
Do.	,,	Do.	London	...
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	U. K. &/or Continent	25
Cube Gambier	,,	Do.	United Kingdom	20
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	30
White Pepper	,,	Singapore	Do.	100
Do.	,,	Penang	Do.	...
Pearl Sago	,,	Singapore	Do.	40
Sago Flour	,,	Do.	London	...
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	Glasgow	50
Tapioca Flake	,,	Singapore & Penang	United Kingdom	95
T. Pearl & Bullets	,,	Do.	Do.	50
Tapioca Flour	,,	Penang	Do.	170
Gutta Percha	,,	Singapore	Do.	55
Buffalo Hides	,,	Do.	Do.	25
Pineapples	,,	Do.	Do.	600
Gambier	,,	Do.	U. S. A.	825
Cube Gambier	,,	Do.	Do.	55
Black Pepper	,,	Do.	Do.	40
Do.	,,	Penang	Do.	60
White Pepper	,,	Singapore	Do.	70
Do.	,,	Penang	Do.	...
T. Flake & Pearl	,,	Singapore & Penang	Do.	700
Nutmegs	,,	Do.	Do.	27
Sago Flour	,,	Singapore	Do.	175
Pineapples	,,	Do.	Do.	cases 1,250

				Tons.
Pineapples	Str.	Singapore	Continent	cases 2,000
Gambier	,,	Do.	S. Continent	10
Do.	,,	Do.	N. Continent	250
Cube Gambier	,,	Do.	Continent	70
Black Pepper	,,	Do.	S. Continent	20
Do.	,,	Do.	N. Continent	40
Do.	,,	Penang	S. Continent	...
Do.	,,	Do.	N. Continent	10
White Pepper	,,	Singapore	S. Continent	30
Do.	,,	Do.	N. Continent	95
Do.	,,	Penang	S. Continent	...
Do.	,,	Do.	N. Continent	...
Copra	,,	Singapore & Penang	Marseilles	700
Do.	,,	Do.	Odessa	...
Do.	,,	Do.	Other S. Continent	440
Do.	,,	Do.	N. Continent	1,600
Sago Flour	,,	Do.	Continent	150
Tapioca Flake	,,	Singapore & Penang	Continent	575
Tapioca Pearl	,,	Do.	Continent	200
Copra	,,	Singapore	England	...
Gambier	,,	Do.	U. S. A.	...
Cube Gambier	,,	Do.	Do.	...
T. Flake and Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	...
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	...
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	...
Pineapples	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...

1,800 tons Gambier }
400 ,, Black Pepper } Contracts.

Singapore.

Abstract of Meteorological Readings for the month of October, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·901	141·3	81·3	89·0	75·0	14·0	78·0	·887	75·8	79	S.E.	4·98	1·07
Botanic Gardens	...	...	...	...	...	...	...	...	...	...		...	...

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL,
Principal Civil Medical Officer, S. S.

Kandang Kerbau Hospital Observatory,
SINGAPORE, 26*th November*, 1905.

Penang.

Abstract of Meteorological Readings in the Prison Observatory for October, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun, mean.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Mean Maximum.	Mean Minimum.	Mean Range.	Mean Wet Bulb.	Mean Vapour Tension.	Mean Dew point.	Mean Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	°F	%		Ins.	Ins.
Criminal Prison Observatory	29·897	141·4	79·7	87·9	72·8	15·1	74·6	·759	69·58	69	N. W.	16·85	2·58

Colonial Surgeon's Office,
PENANG, 10*th November*, 1905.

M. E. SCRIVEN,
Assistant Surgeon.

J. COLIN C. FORD,
for Acting Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for the month of October, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Durian Daun Hospital ...	29·819	156·8	80·4	88·0	74·5	13·4	80·1	1·000	72·0	90	N.W.	7·28	2·10

F. B. CROUCHER,

Colonial Surgeon, Malacca.

Colonial Surgeon's Office,

MALACCA, 17*th November*, 1905.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of October, 1905.

DISTRICT.	Maximum in Sun.	Temperature.				Hygrometer.			Total Rainfall.	Greatest rainfall during 24 hours.
		Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	156	80·84	93	71	22	76·87	871	82	17·10	2·69
Kuala Kangsar ...	...	79·80	92	71	21	75·61	833	82	15·73	2·97
Batu Gajah ...	163	80·37	92	71	21	76·03	842	81	15·60	2·48
Gopeng ...	...	79·70	92	65	27	75·79	840	83	13·83	3·00
Ipoh ...	...	80·23	92	74	18	77·56	910	89	11·52	1·71
Kampar ...	...	...	...	73	...	...	...	...	24·11	5·60
Teluk Anson ...	...	80·71	92	70	22	76·99	880	85	11·14	3·65
Tapah ...	...	80·15	93	70	23	76·10	848	82	21·09	5·07
Parit Buntar ...	...	81·41	92	72	20	76·92	865	81	11·28	1·87
Bagan Serai ...	...	81·00	91	70	21	76·42	850	80	7·05	0·90
Selama ...	...	80·58	91	63	28	76·80	874	85	17·50	1·95

STATE SURGEON'S OFFICE,

TAIPING, 15*th November*, 1905.

M. J. WRIGHT,

State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of October, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·881	146·7	79·4	89·4	70·9	18·5	75·9	0·831	73·5	80	Calm.	7·66	2·30
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	4·09	1·47
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	5·55	1·18
,, Klang	...	...	...	87·6	70·3	17·3	...	...	...	...	...	7·45	1·92
,, Kuala Langat	...	...	...	...	...	...	...	...	...	...	...	4·44	1·05
,, Kajang	...	...	...	89·6	72·1	17·5	...	...	...	...	...	6·63	1·52
,, Kuala Selangor	...	...	...	...	...	...	...	...	...	...	...	6·90	2·70
,, Kuala Kubu	...	...	...	90·3	72·1	18·2	...	...	...	...	...	15·28	2·37
,, Serendah	...	...	...	89·1	73·9	15·2	...	...	...	...	...	12·36	3·22
,, Rawang	...	...	...	90·7	70·1	20·6	...	...	...	...	...	14·48	5·25
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	5·74	1·25
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	..	5·74	1·19

State Surgeon's Office,
Kuala Lumpur, 16th *November* 1905.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Muar.

Abstract of Meteorological Readings for the month of October, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Tempurature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Lanadron Estate ...	...	...	82°	90°	72°	18°	75°	...	...	...	...	9·74	2·45

MUAR, 16*th November*, 1905.

ROGER PEARS.

The Duff Development Company, Limited, Kelantan.

Abstract of Meteorological Readings for the month of October, 1905.

DISTRICT.	Temperature.				
	imum.	Minimum.	Range.	Total Rainfall.	Greatest Rainfall during 24 hours.
		Mean. °F	Mean. °F	Inches.	Inches.
Kuala Lebir ..	89·0	71·0	18·0	8·61	1·58
Ulu Liang ...	87·5	71·4	16·1	15·79	2·80
Serasa ...	90·9	70·8	20·1	16·12	3·50
Kuala Kelantan ...	84·8	74·2	10·5	10·59	2·31

SURGEON'S OFFICE,
9th November, 1905.

JOHN D. GIMLETTE,
Surgeon.

METEOROLOGICAL OBSERVATIONS.

Table Showing the Daily Results of the Reading of Meteorological Observations taken at the General Hospital, Seremban, for the Month of October, 1905.

Date.	Temperature of radiation.						Temperature of radiation.				Wind. Direction.		Temperature of evaporation.			Computed vapour tension.			Relative humidity.			Clouds 0 to 10.			Cloud and weather Initials.			Rain.
	9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Sun.	Difference sun and shade.	Grass.	Difference shade and radiation.	9 H	15 H	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	21 H	9 H	15 H	21 H	Inches.
	°	°	°	°	°	°	°	°	°	°			°	°	°	in.	in.	in.	°	°	°							
1	85	82	83·5	84	72	12	143	59	...	...	E.	S.	17·8	73·6	72·7	0·781	0·830	0·805	64	76	70·	0	3	3	B	C	C	.05
2	83	78	80·5	85	72	13	139	54	...	...	E.	S.E.	76·3	76·3	76·3	·905	·906	·905	80	94	87·	0	5	3	B	C	C	.22
3	83	84	83·5	86	71	15	143	57	...	...	S.E.	S.E.	75·3	72·	73·6	·877	·802	·839	80	76	78·	3	5	5	C	C	C	·57
4	80	70	75	85	70	15	137	52	...	...	S.E.	S.E.	73·3	66·5	69·9	·820	·651	·735	80	88	84·	5	10	5	C	R	C	2.70
5	82	83	82·5	85	71	14	138	53	...	...	S.E.	S.E.	73·6	74·7	74·1	·830	·856	·843	76	76	76·	0	3	0	B	C	B	
6	82	79	80·5	84	72	12	131	47	...	...	E.	S.E.	72·	75·6	73·8	·785	·888	·836	72	90	81·	0	8	2	B	O	B	·44
7	85	82	83·5	83	71	12	146	63	...	...	S.E.	S.E.	71·8	75·3	73·5	·781	·877	·829	64	80	72·	2	8	10	B	O	R	·93
8	83	82	82·5	83	71	12	146	63	...	...	S.E.	S.	74·7	72·	73·3	·856	·785	·820	76	72	74·	0	3	3	B	C	C	.20
9	83	83	83	84	72	12	146	62	...	...	S.E.	S.E.	71·3	78·	74·6	·766	·956	·861	68	85	76·5	0	3	2	B	C	B	·74
10	83	82	82·5	83	72	11	142	59	...	...	E.	N.E.	74·7	75·3	75·	·856	·877	·866	76	80	78·	0	3	5	B	C	C	2.91
11	80	81	80·5	83	72	11	142	59	...	...	N.E.	N.E.	73·3	76·	74·6	·820	·897	·858	80	85	82·5	3	10	3	C	R	C	·30
12	82	83	82·5	84	72	12	142	58	...	...	N.E.	N.E.	75·3	78·	76·6	·877	.956	·916	80	85	82·5	0	0	2	B	B	B	
13	82	84	83	85	72	13	128	43	...	...	N.E.	S.E.	75·3	74·	74·6	·877	·840	·858	80	72	76·	3	3	2	C	C	B	
14	82	85	83·5	86	72	14	144	58	...	...	S.E.	S.E.	73·6	71·8	72·7	·830	·781	·805	76	64	70·	0	0	2	B	B	B	
15	82	76	79	85	72	13	138	53	...	...	N.	N.E.	77·	72·6	74·8	·926	·801	·863	85	89	87·	0	5	5	B	C	C	·34
16	85	81	83	82	72	10	149	67	...	...	E.	E.	73·4	76·	74·7	·826	·897	·861	68	85	76·5	2	3	5	B	C	C	.26
17	81	84	82·5	85	73	12	144	59	...	...	E.	E.	74·	72·4	73·2	·849	·794	·821	80	68	74·	3	0	3	C	B	C	
18	85	89	87	90	72	18	142	52	...	...	S.E.	S.	71·8	71·1	71·4	·781	·757	·769	64	55	59·5	3	0	0	C	B	B	·78
19	78	82	80	88	72	16	140	52	...	...	S.E.	S.E.	72·9	75·3	74·1	·810	·877	·843	84	80	82·	0	0	0	B	B	B	
20	83	88	85·5	89	71	18	145	56	...	...	S.E.	S.E.	73·	70·	71·5	·810	·733	·771	72	55	63·5	0	0	0	B	B	B	.16
21	80	87	83·5	89	72	17	144	55	...	...	S.E.	S.E.	73·3	72·2	72·7	·820	·792	·806	80	61	70·5	0	0	0	B	B	B	.08
22	80	87	83·5	88	72	16	147	59	...	...	S.E.	S.E.	73·3	72.2	72·7	·820	·792	·806	80	61	70·5	0	0	0	B	B	B	
23	80	86	83	87	71	16	147	60	...	...	S.E.	S.E.	71·6	72.8	72·2	·775	·808	·791	75	64	69·5	0	3	5	B	C	C	
24	83	88	85·5	89	73	16	148	59	...	...	S.E.	S.E.	73·	76·5	74·7	·810	·913	·861	72	69	70·5	0	0	2	B	B	B	
25	82	90	86	92	73	19	147	55	...	...	N.E.	N.E.	73·6	70·5	72·	·830	·745	·787	76	53	64·5	0	0	3	B	B	C	
26	83	92	87·5	94	71	23	150	56	...	...	N.E.	N.E.	71·3	72·6	71·9	·766	·802	·784	68	53	60·5	0	0	0	B	B	B	
27	80	79	79·5	85	73	12	109	24	...	...	E.	N.E.	75·	73·9	74·4	·867	·839	·853	85	85	85·	3	3	0	C	C	B	
28	83	88	85·5	89	72	17	146	57	...	...	S.	S.	73·	78·2	75·6	·810	·964	·887	72	73	72·5	0	0	0	B	B	B	
29	84	86	85	87	72	15	142	55	...	...	S.E.	S.E.	72·4	72·8	72·6	·794	·808	.798	68	64	66·	0	0	5	B	B	C	.26
30	75	88	81·5	90	73	17	145	55	...	...	S.E.	S.E.	73·3	74·9	74·1	.820	·865	·842	94	65	79·5	5	0	0	C	B	B	
31	80	88	84	90	74	16	144	54	...	...	E.	S.E.	73·3	71·6	72·4	·820	.775	.797	80	58	69·	0	0	0	B	B	B	

Total 10·94

State Surgeon's Office,
Seremban, *8th November*, 1905.

R. VAN GEYZEL,
Apothecary.

No. 12.] DECEMBER, 1905. [Vol. IV.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens, S. S.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, &c. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

3. The Federated Malay States Government has undertaken to grant a sum of £100 a year for 5 years to the Department with a view to the careful investigation and commercial development of the mineral resources of the States.

The Government Geologist is collecting specimens for chemical examination and after analysis the Imperial Institute which is in very complete touch with the principal manufacturing and other industries of the United Kingdom, will bring the specimens before manufacturers and others for trial with a view to their commercial development.

It is expected that this action will do much to help in finding a market for new products and developing the markets for those already exploited.

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RUBBER PESTS.

Dr. Lim Boon Keng writes that he finds two enemies very destructive of seedlings a few days old. The first of these is a kind of slug which gnaws off the skin of the seedling which generally breaks off at the point.

This is doutless the brown slug which has been lately giving a good deal of trouble at the Botanic Gardens. The animal is about 1½ inch long, light brown and very slimy. It only appears towards dusk, concealing itself in the herbage near during the day. It attacks the young plants as described by Dr. Lim Boon Keng, and also gnaws the green parenchyma and the epidermis of the leaves away leaving only the skeleton of the leaf. It attacks too the young plants up to six or more feet tall nibbling the bark and biting away the buds as they appear checking seriously the growth of the young tree, and causing it to put forth many small buds at the top, which being destroyed as they grow by the slugs, give the tree a stunted and diseased appearance. The only remedy seems to be to collect these animals in the evening by hand and destroy them. Keeping down the weeds near the nursery will doubtless have a good effect, so as to leave no hiding place for them, but a number of seedlings in boxes on a stand raised above the ground in a place bare of herbage were on one occasion badly attacked and many destroyed. They do not seem to attack trees of full size unless the leaves of the lower branches touch the ground, and do not seem to climb up the trees except in the cases of the young stumps referred to.

The second enemy Dr. Lim Boon Keng refers to is a large cricket probably a *Gryllacris*, and thought by Dr. Hanitsch of the Museum to be *G. tessellata.* "This insect saws the seedling right through leaving a stump 1 to 3 inches tall and carrying off the tender shoot or pulling up the seeds which it carries to its deep burrows. A couple worked in a nursery bed unnoticed and in a couple of nights did a lot of damage. I opened up all burrows and captured the insects in their lair."

These crickets are extremely destructive, and one or two seem to be able to move down a great quantity of seedlings in a night. A bed of melon seedlings was thus destroyed by one of these animals in a single night, not one seedling out of some hundreds escaping. Fortunately, as a rule, these animals are not exceedingly abundant, generally appearing in pairs. Their jaws are very powerful and I have been bitten clean through the finger by one I attempted to catch, which was being pursued by a large brown sunbird (*Arachnothera*). These birds together with the Bulbul, and the so called Magpie robin, attack these crickets whenever they find them. The crickets, however, hide during the day in the ground, or in rolled up leaves on the trees. They are attracted by light and I have seen them caught in mosquito netting moth-traps with a light inside. On several occasions I have found them concealed in the clothes in a cupboard, they having flown into the light during the night, and surprised by day fled to hide in the darkest place they could find.

A light kept burning at night over a pan of molasses or some such sticky substance or of water to which kerosine has been added will catch a large number of crickets but chiefly the smaller and less destructive kinds. The big rarer ones should be traced to their burrows whenever damage caused by them has been noticed. —*Editor.*

REPORT UPON A VISIT TO GREAT BRITAIN TO INVESTIGATE THE INDIA-RUBBER INDUSTRY IN ITS RELATION TO THE GROWTH AND PREPARATION OF RAW INDIA-RUBBER IN THE MALAY PENINSULA.

1. Early in 1905, at the request of the United Planters' Association of the Federated Malay States, supported by the Federated Malay States Government, the Government of the Straits Settlements seconded me on special duty for six months, and I travelled to Europe to investigate the condition there of the india-rubber industry with the object of enabling the india-rubber planters and the producers of the raw material in the East to supply their rubber in the form most suited to the needs of the manufacturers, and by bringing the East and West into touch to stimulate the growth of the rubber-planting industry. I left Singapore on March 2nd, and arrived in London on March 26th.

2. My first action on reaching London was to set about obtaining official introductions to various india-rubber manufacturers through the Colonial Office, the War Office and the Admiralty, and to amplify those private introductions with which I had been supplied in the East.

CREPE RUBBER.

3. Until the spring of 1905 all fine plantation rubber had been shipped in the form of flat sheets or "biscuits" prepared from the rubber latex by simple coagulation in pans with the addition of acid, squeezing the coagulated sheet under a hand roller and then drying with or without the aid of heat. A new method of preparation had been introduced into the Malay States involving the washing of the coagulated rubber on a power-driven machine between metal rollers, and the resulting rubber was produced in the form of crepe or washed sheet. Small samples of this rubber had been submitted to various manufacturers for report, but the first large shipment with which to test the London market arrived in London towards the middle of April. In order that this should be fully brought to the notice of the buyers and manufacturers I wrote and published an account of its history and preparation in the "India-Rubber Journal," whose Editor had always taken great interest in all attempts to improve plantation rubber. An offer of samples was also made in the journal, and samples of the rubber were subsequently sent by me to a number of the principal rubber manufacturers. An analysis of the rubber was made by Mr. BALLANTYNE, of Chancery Lane, a copy of which was shown with the sample of the rubber at the sale rooms.

BUYERS' VIEWS OF CREPE RUBBER.

4. The sale took place on Friday, May 12th, in Messrs. FIGGIS' sale rooms, the market was firm and prices were high. Much interest in the crepe rubber had been shown by the buyers, but the majority of the opinions openly expressed were adverse and critical, since the samples were of a kind new to the buyers. When the first lot of the crepe was put up there arose from the head of the room a cry of "We don't want washed rubber, we want to wash our own," which plainly showed the nature of the opposition. However, in spite of this open disapproval on the part of some, the rubber sold at 6/8 and 6/8½ per lb. which was 1*d.*–1½*d.* above the price on the same day, and in the same sale, of fine plantation "biscuits" clean and dry and with which no fault could be found.

5. The cause of this action on the part of the buyers was not easy to determine. No pretence was made that the rubber after washing was injured or made inferior to "biscuit" or that it would be less readily accepted by users of plantation rubber, and no explanation other than the statement that washed rubber was not wanted could be obtained from the objectors themselves. An explanation of the disapproval which seems reasonable, supplying as it does a personal motive, was obtained later from indirect sources. Raw rubber is not bought direct by the manufacturers at auction, but from the "buyers." The latter buy in bulk and divide their purchases into lots of different qualities (usually into three) and sell this regraded rubber at different rates, making a substantial profit on this transaction. A rubber of standard quality, uniform, clean and pure such as crepe or plantation-washed rubber

offers no opportunity for this sorting and grading process and the profit derived from dealing in it would be less. A further possible explanation is that with a pure rubber of uniform quality an opportunity for direct buying on the part of the users of the material would be afforded.

MANUFACTURERS' VIEWS OF PLANTATION RUBBER.

6. By all the manufacturers a very keen and lively interest is shown in plantation rubber and in the prospect of being able to obtain rubber of fine quality from the East. The immediate need is for quantity, and exaggerated views of the amount that is to be expected in the near future from plantations were prevalent. No inclination to deal directly with the producer in small lots of a few tons was shown by any of the larger manufacturers, the difficulty being that the supply would be too small and irregular to justify any departure from methods of buying already in practice, and added to this is the fact that plantation rubber is of a different quality and grade from any other in the market, and it requires treatment different in detail in practical working; that the rubber should be clean, dry, and free from mechanical impurity is essential, and in these respects plantation rubber has already gained a considerable reputation. That it should be free from any trace of softening or stickiness is still more important, rubber which is "tacky" in the slightest degree cannot be relied upon in practical use. Unfortunately there has been a considerable amount of rubber showing this defect of softness with a sticky and tacky surface, produced on plantations, and these samples have tended to injure materially the reputation of plantation rubber.

7. The form in which the rubber is exported—whether in sheets, biscuits, crepe (washed rubber), or worms, as produced in Ceylon—is not a matter on which the manufacturers expressed any very decided opinions. As long as the rubber is evidently dry and clear enough to show by inspection the absence of any mechanical impurity, the precise, shape and form of the rubber is considered of comparatively small importance, although preference for rubber in the form of crepe was shown by some, and all with one exception were agreed that it was as good a condition for packing and exporting rubber as any. The fact that crepe rubber has been subjected to a washing process is not at present regarded by the manufacturers as of much advantage. Plantation washed rubber for ordinary purposes need not be re-washed and re-sheeted, but this same advantage applies also to clean biscuit, sheet, or worm rubber. For special purposes all forms of raw rubber would be re-washed in the factory. The advantage of crepe rubber would be felt when larger bulk of it is put upon the market because greater uniformity of quality and appearance could be maintained. Up to the present this has not been of practical importance in dealing with small parcels of a few tons or fractions of tons, but it would be a distinct advantage to have perfect uniformity when dealing with large bulk and regular shipments, and this is secured by the mechanical washing and mixing in bulk

which results in the production of crepe rubber. Although at present neither clean biscuit, sheet, worm, nor crepe rubber need be washed for ordinary use, yet if washing and sheeting plantation rubber is to be dispensed with in the manufactory, it would be a great advantage when dealing with the larger quantities to have it ready in the washed and sheeted form, and the advantage of crepe over other forms would be most marked when dealing with many tons at a time.

ADULTERATION OF WASHED RUBBER.

8. There is one danger connected with the use of a washing machine on a plantation. By its means adulteration with inferior rubber, rubber substitutes, and recovered rubber, could be carried out without possible detection by eye or hand inspection, although chemical analysis or practical use of the rubber would reveal the sophistication. In unprincipled and fraudulent hands such adulteration might be carried to a considerable pitch before detection occurred, and this possibility of misuse should not be lost sight of by those who are responsible for the purity of the rubber produced.

ANALYSIS OF RUBBER.

9. The chemical composition of rubber has no consideration either from the buyers or the manufacturers—the former base their valuation entirely upon the appearance, feel, smell, and apparent strength of the rubber when pulled about in their hands, the latter rely chiefly upon the way the rubber works upon their machines during manufacture, though in a few instances properly controlled and systematically carried out tests of tensile strength and elasticity are made with samples of the rubber prepared and vulcanised. The percentage amount of the impurity which is inherent in the rubber and which cannot be removed by washing—that is, the oily, resinous, and nitrogenous, or proteid, impurity—is practically never determined in the factory, and a statement of these values with the rubber for sale would neither be understood nor attended to. In the present state of ignorance as to the influence of these ingredients upon the working qualities of the rubber during manufacture, the apathy with which variations in their amounts in the raw material are regarded is natural and quite intelligible.

PACKING.

10. There are several points which must be remembered in packing rubber. Rubber at temperatures above 65°F. is naturally adhesive, and clean surfaces pressed into contact tend to stick to one another, though the rubber be dry and show no vestige of tackiness. Rubber during transit invariably shrinks in bulk owing chiefly to the action of its own weight in compacting the mass, and partly perhaps to a natural shrinkage of the rubber substance with the ageing of the rubber. Dust and grit which find way inside the cases adhere to the rubber. The care requisite in packing, therefore, depends upon the form in which the rubber is shipped. If

in clean washed crepe, which it is hoped will be used without further washing and sheeting, every care should be taken to prevent the layers adhering to one another, and to avoid the use of any packing material which can make a dust out of itself, or which will admit dust and grit from outside. This can be effected by the use of clean, well made and fitted cases, which should not contain more than 80-100 lbs. of rubber, and which might with advantage be partitioned to prevent the whole of the rubber resting with full weight upon itself. No inner lining of common paper or other friable material should be used—such wrapping is bound to get broken in transport, and particles of it work their way between the layers of rubber, and obstinately adhere to the rubber. The first shipment of crepe rubber which I saw unpacked had been enclosed in wooden cases with paper lining. When the folds of separate layers of rubber were pulled apart, a shower of fine grit, particles of paper, and dust, was then thrown out from the rubber This rubber, though well cleaned and washed on the estate, would for fine work have required re-washing. The separate sheets of crepe had adhered firmly into one solid mass which required a crowbar to separate into the original layers, and the whole had shrunk leaving a space of about an inch between the rubber and the sides of the case. If any wrapping to prevent the intrusion of dust and grit be used it should be either smooth and strong such as sheet zinc lining or else made adherent to the sides of the cases—as, for instance, strips of smooth paper pasted over the joints in the wood inside the cases. With less perfectly prepared rubber in biscuit, or worm form, which will require washing before use, a less careful form of packing might be adopted. It must be of course always remembered that the rubber is valued by its appearance very largely, and uniformity in size and colour of the sheets will have some influence in determining the price, though really being no guide to the actual quality of the rubber.

QUALITY OF PLANTATION RUBBER.

11. On this subject I met with a perfect uniformity of opinion among those who had practically made trial of Straits and Ceylon rubbers. All were agreed that the rubber was good and very serviceable, but that it was by no means as good as South American fine Para, either hard or soft cure. The plantation rubber is lacking in nerve, it works soft between the masticating rollers, and its keeping qualities are inferior to South American Para. After vulcanisation the tensile strength is less and the elastic recovery of shape after deformation by stretching or compression is less perfect than shown by South American Para under precisely similar conditions. This result is disappointing and quite contrary to the report which the late Dr. Weber made on plantation rubber, when he stated that he found the tensile strength to be superior to that of South American hard-cure Para.

12. That the result of practical experience of the rubber manufacturers must be accepted, there can be no question. There was no hesitation on their part in demonstrating to me the difference

in working of the two classes of rubber, and in several cases—notably at Silvertown, where accurate tests of all rubbers used are carried out, the recorded figures were submitted to my inspection, and an inferiority of from 8 per cent. to 15 per cent. with different samples was shown. The inferiority of plantation rubber is not only confined to those physical properties which are capable of immediate measurement, but is also shown in the keeping qualities of the rubber. I was shown samples from different estates in Ceylon and the Straits which had been sent home in 1902 and 1903, and which had been preserved in air-tight jars side by side and in the same room with samples of jungle rubbers from South America and Africa. One sample prepared in 1902 was quite perished and rotten, its elasticity was entirely lost, and it was more like a sheet of dough than rubber. Other samples of plantation rubber had all shown marked deterioration in the three years. To compare with these were samples of South American Para of ages up to and over forty years which had preserved perfectly their tough and elastic qualities. This feature of plantation rubber is one which is now beginning to be realised, and though it probably is due to errors committed in preparation of the samples in question two or three years ago, it confirms practical users of rubber in their opinion that plantation rubber is not reliable, and certainly not the equal of South American Para.

13. The cause of the inferiority of plantation rubber when compared with pure South American Para rubber is not known. Some of the manufacturers believe it to be due to differences in the locality, climate, and conditions under which the trees are grown; others incline to the belief that the difference in quality is the result of difference in mode of curing and exporting, and again the difference in age of tree from which the rubber is gathered may very probably be the actual reason for the difference in quality of the rubber. There is a further suggestion which has, I believe, never yet been made. The rubber trees of South America which are tapped are selected both by natural and by artificial selection. The condition in South America is, I understand, one of jungle in which the trees affect, and compete with, one another, and this leads to the survival, by natural selection, of the finest and most sturdy only of the seedlings. The native in tapping selects the best of the trees he conveniently can, and here the influence at work is one leading to the rejection of weak and badly developed trees. On the plantation after the first selection of the stumps and seedlings, no further selective process is actively at work. To determine whether this has any influence on the quality of the rubber, tapping should be done on specially selected trees, and the quality of the rubber extracted compared with the average rubber of that plot of trees. All opinions at present must be looked upon as guesses at the solution of this question, the only thing certain is that plantation rubber is inferior, and this certain knowledge is one of the most important results of my visit to England. I propose to endeavour to find out in Singapore, and on the plantations themselves, the actual reasons of this inferiority by experimental

work; and to this end I have had made in Manchester, by a firm of manufacturers of rubber machinery, at the expense of the Colonial Government, machines for practically working up and vulcanising rubber, and I intend with the aid of these machines to manufacture test pieces of vulcanised rubber from raw rubber taken from trees grown in various localities of different age and cured in different ways. With these samples of vulcanised rubber physical tests of elasticity and tensile strength will be carried out, and a just comparison of the samples among themselves, and with true South American Para, can be made. There are special difficulties in carrying out physical tests on india-rubber, and there is at present no uniform method of stating results; comparisons between tests made by different places are therefore of little value, and it is essential that all the work be done in the same manner on the same type of apparatus, to eliminate the personal equation and correctly ascribe to each variant factor in the production of the raw rubber its consequent variation in the quality of the product. When this is done I shall be able to say with certainty which method of preparation gives the best results, and to ascribe correctly to each and every one of the variable conditions under which the rubber is produced its true influence on the quality of the rubber. This work I look upon as being important, and it will, I trust, settle decisively many of the problems which now are controversial. To see clearly the necessity for the work, and to have gained the insight into the methods of treating and vulcanising rubber necessary for carrying it out, are the direct results of my visit to England, and the time spent in the works of the rubber manufacturers there.

PREPARATION OF RAW RUBBER.

14. I have already stated I am not at present in a position to say decisively how the rubber should best be coagulated and prepared for export, but I am inclined to recommend that as little as possible in the way of acids or drugs should be added to the milk or latex. Where a washing machine is used, the milk might, I think, with advantage be allowed to coagulate by simply standing for 24 or 36 hours and allowing the natural fermentation, or scouring, which takes place, to produce coagulation. This of course will preclude any possible additions of preservative, such as formalin or dilute ammonia, to the latex in the cups and it will be desirable to keep the latex as concentrated as possible. This natural method is of course only possible where a washing machine is used, and it involves more time being taken in the actual coagulation process. There is among the manufacturers an objection to the use of any acid or addition of any drug at all to the rubber during coagulation, from fear that traces of it might be left in the rubber, even after washing. If there were an appreciable amount remaining, it is highly probable that it would give trouble during working and vulcanisation of the rubber by acting chemically on some of the ingredients with which the rubber is mixed and perhaps producing gases which would form blow holes in the finished goods.

These bubbles and blow holes do sometimes occur after vulcanisation, and care has always to be exercised to prevent their occurrence, and anything which might lead to their formation has to be carefully avoided. Whether this objection to the use of a volatile acid in curing the rubber is really sound, can only be decided by practical experience in working with rubbers so cured, but the objection is actually held, and the fear entertained, by some of the most prominent of the rubber manufacturers in England, and the knowledge of the fact that acids have been used in the curing of plantation rubber makes the manufacturer less inclined to use crepe or plantation washed rubber without a further re-washing in the factory. Another objection to the use of acid preservative, and the addition of any drug at all to the latex, lies in the possible action of such drug on the rubber itself. Speaking *à priori* and considering the mild chemical character of acetic acid, and the preservative action of formalin, together with the singularly inert nature of rubber, I should not expect any harmful action whatever to occur. I have, however, seen samples of rubber made from latex to which small amounts of various aniline dyes had been added. Some of the dyes (the reds especially) had produced most marked effect, making the rubber hard and brittle, and as readily torn as thick paper. Other dyes appeared to have had little deleterious effects. This perishing of the rubber had certainly been brought about by the action of quite trifling amounts of what are regarded as harmless and inactive chemicals. I have already mentioned cases of plantation rubber perishing utterly in a few years from unknown causes. With these instances before me I feel less inclined to treat the possibility of acetic acid or formalin causing rubber to perish as absurd or fanciful, and until the question has been experimentally investigated I should recommend that, wherever possible; the use of any chemical whatever be avoided. The position is therefore this—some of the users of rubber object to the rubber being cured with acid, and in the absence of experimental evidence we are not justified in assuming acids, even vegetable ones such as acetic, to be harmless. To avoid using any coagulant is only practically possible where a mechanical treatment of the rubber by a washing machine is in use, and then it is a matter for consideration whether the use of acid, which has been extremely convenient in assisting and controlling coagulation, should be discontinued from fear that such use will produce a rubber which will not stand the test of time, and which will perhaps injure in the future the reputation of plantation grown and cured rubber.

DRYING RUBBER.

15. Until the introduction of mechanical washing of coagulated rubber and the formation of crepe, drying had been a troublesome operation in the preparation of rubber for export. Artificial heat almost always led to the softening of the rubber, and often through inefficient control of the temperature caused it to become distinctly tacky. Crepe rubber dries easily and well if simply hung up in a dark but airy shed, and the preparation of rubber in this form

appeared to have solved the old difficulties associated with drying. There had been, however, suggestions and proposals to introduce vacuum drying on estates, and consequently I paid special attention to the modes of drying washed rubber in use in Great Britain. In a few manufactories only I found vacuum drying had been introduced, but the great bulk of washed rubber is still dried by hanging it up in dark warm rooms. A vacuum drying chamber is a large iron box, of from 100 to 200 cubic feet capacity, fitted inside with shallow iron trays with perforated bottoms, and heated with steam pipes. The interior is connected by an iron pipe with an exhaust pump. Wet rubber is placed in the iron trays, the doors are closed, and the temperature raised to 120 to 130 degrees F., and the pump started. The air and water vapour that are drawn out of the chamber are passed through a condensing cylinder, fitted with a glass front, and the condensed vapour is seen falling as a stream of drops of water. After two or three hours this stream of drops of water ceases, and the rubber or whatever material is being operated upon is then regarded as dry and ready for removal. Rubber dried in this way is always softened by the heating which is necessary if the drying is to be rapid, and in the opinion of manufacturers who have not adopted the process the nerve and quality of the rubber are injured, though with those who have adopted vacuum drying this is not regarded as very important, chiefly because the cause of softening is known, and it is regarded as only an anticipation of the softening which always occurs in mastication of the rubber, the next step in the process of manufacture. On the other hand, some forms of rubber—such as very soft African rubbers—cannot be dried in this way at all because the softening in their case proceeds too far. The sheets of rubber dried in this way adhere to one another when packed and stored away, this is of no importance in the factory, because the rubber is known to be clean and dry and ready for use, but if plantation rubber were offered in the same soft and adhesive masses, objection, and serious objection, would naturally be made. It would be necessary to maintain a lower temperature in the vacuum chamber than is in common use if this softening of the rubber is to be entirely avoided, and this would seriously interfere with the efficiency of the machine. The rate of the evaporation of the water and drying of the contents depends upon the difference between the temperature of the vacuum chamber and the temperature of the condensing chamber, as well as upon the absolute temperatue of the vacuum chamber. In the tropics it will not be possible to maintain the condenser below 80 deg. F., which is 20 degrees above the temperature of the condenser in England. This diminished difference, together with the necessary lowering of the temperature of the vacuum chamber itself, will seriously impair the efficiency of the vacuum drier, the only advantage of which is the rapidity of drying. Taking into consideration the further fact that plantation rubber is always inclined to be soft, I should certainly not recommend any form of drying in which artificial heat is necessary, and which involves the elaboration of machinery and increase in power in doing what, with washed rubber, can be done in a more simple, safe and natural manner.

MANUFACTURE OF RUBBER.

16. PRELIMINARY PROCESSES.—The various processes through which raw rubber passes in conversion to rubber goods were, as a whole, very freely shown to me by the British rubber manufacturers. Introductions to the leading firms from the War Office and Admiralty, who are large consumers of rubber goods, were obtained through the Colonial Office, and these, together with sundry personal and private introductions, proved to be all that was necessary, and I met with great consideration, kindness and courtesy from all with whom I came into contact. In a few cases there were special and particular processes which were guarded as trade secrets, but this tendency to secrecy was in inverse proportion to the size and importance of the works. The greatest interest was shown in plantation rubber and the prospect of a future easing of the rubber market by supplies from the East, and the manufacturers realise that there can be no antagonism between them and the planters, and appreciate the efforts being made to bring the producer and consumer into closer touch.

17. The raw rubber used is of all kinds and qualities, from clean pure fine Para to the lowest grades of African rubbers, which are sticky, black, full of wood, stones and dirt, and all possible adulterations. Fine Para is delivered in balls weighing from five or six to a hundred pounds: when cut open the mass is seen to be made up of concentric shells from $\frac{1}{8}$ to $\frac{1}{3}$ inch in thickness, the rubber is grey and wet and the successive laminæ are marked by dark surfaces, showing the stages of successive smoking and accumulation of the rubber into the balls. This rubber is never dry, but contains water—the amount usually being about 15 per cent., but varying from 10 to 20 per cent., and the loss of weight of fine Para in washing and drying is due to this water contained in it. In the best qualities there is little or no mechanical impurity, at most a little surface dirt and grit.

WASHING RAW RUBBER.

18. The first thing to be done is to cut these large balls open and reduce the largest masses to blocks of five to ten pounds in weight. The rubber is then softened by boiling in water, this is done to enable the washing machines to deal with the lumps.

The rubber is then broken and washed on machines which are simple in construction and action, and exactly similar in essentials to the rubber-washing machines in use in the Malay Peninsula on plantations.

Each machine consists of a pair of steel rollers with roughened faces, revolving at different speeds on horizontal axes, the faces of the rollers being in contact or slightly separated from one another. The rollers are from one to two feet in length, and usually one foot in diameter. The surfaces are roughened with grooves cut spirally, or diamond shaped, and of different angles and depths according to the nature of the work. Cold water is always playing over the surfaces of the rollers in use, and it is directed usually above the rollers on to the rubber in the hopper, but in some cases at the sides, with the object of washing the dirt away from the rubber as the rubber emerges from between the rollers. The rubber usually goes through two sets of rolls, the first two break down the big lumps and roughly sheet the rubber, the second pair of rolls is smoother and in closer contact, and the final washing and working into a fine-grain uniform sheet is performed on these. In preparing rubber for the very finest work, such as cut sheet, a third set of rollers with smooth chilled steel surfaces is used. The object of these is to crush any particles of sand or grit which might otherwise be left in the rubber and damage the knives and spoil the sheet rubber when being cut. The rollers are always provided with metallic guides to keep the rubber away from the ends of the rolls and prevent contamination with grease and oil from the bearings. There is great uniformity of pattern and general arrangemeut of these washing mills in all the factories, the differences are in the form of grooving and roughening of the surfaces. The rollers which produce the smoothest and most uniform sheets are those in which the grooves are nearly obliterated, and in which the surface has become rough with the natural wear of the metal: rolls in this condition would, I think, be most effective with freshly coagulated latex on an estate.

DRYING.

19. The rubber in the washed or crepe form is wet not only with surface moisture but with water held in the substance of the rubber itself. It is usually dried by hanging up the strips in dark rooms warmed to about 90° F., an operation taking about a week or ten days. In no case did I notice any artificial circulation of the air to accelerate the drying. A few manufactories have adopted vacuum drying, which I have already described and discussed. There is no sign, however, of this process ousting the older fashioned method of simple air drying.

MASTICATING RUBBER.

20. The next process through which the washed and dryed rubber passes is that of mastication, during which the rubber is torn, stretched, heated, and generally kneaded about until the toughness and elasticity, so characteristic of it hitherto, are destroyed, and the rubber becomes plastic.

The masticating machine consists of two steel rollers with smooth polished faces, which revolve on horizontal axes in the same horizontal plane. The distance between the two rolls can be adjusted until they are brought into contact with one another. The rolls may be of any convenient size, and are usually about 3 feet in length and 12 to 18 inches in diameter. They are hollow and heated by injected steam, and may be driven at even or differential speeds. The machine, in fact, is in many respects similar to a rubber-washing machine, but differs in the rollers being smooth and being worked hot and dry and revolving more slowly. The action on the raw rubber is curious, with the rolls separated about $\frac{1}{16}$ of an inch a mass of washed rubber is thrown upon the machine, it is squeezed into a uniform sheet which is folded over on itself by the workman, and a slab of rubber produced ½ to ¾ of an inch thick, to be fed again into the machine.

The rubber, softened by the heat of the rolls, behave like so much putty, accumulating on the inturning faces of the rollers, heaving and seething as it is made to flow over itself, and gradually being worked through into a thin sheet, which adheres to the more slowly moving roll, the one next the workman. As this sheet comes round, wound on the roll, the workman with a stumpy knife slices it through, and peels it off, folding it over upon itself to repeat the operation of being sucked through the roll over and over again. In its passage reports as of saloon pistols are heard, as the air imprisoned in the folds of rubber is compressed, and finally bursts through the writhing mass of distended and flowing rubber, reluctant to pass through the narrow cleft to freedom. In this torturing process the fine hard cure South American Para rubber shows its superior quality and remains tougher and harder than plantation rubber when perfectly masticated. But even with South American Para the elasticity and nerve are lost, the rubber has no spring and can be bent and torn, indented and cut, and is compliant to any shape which is impressed upon it. The colour has changed, in the case of plantation rubber from the pale yellow or brown to a dirty grey, and the whole nature of the material has undergone a metamorphosis: but what this change really consists of no one can now tell.

MIXING.

21. The masticated rubber is ready now to be mixed with the hundred and one ingredients with which it is to be compounded. The requisite amount of sulphur in fine powder is added, with zinc oxide, red lead, plumbago, asbestos, powdered pumice, recovered rubber, rubber substitutes, rubber of other grades and qualities, sulphide of antimony, lime, vermilion or any of all those substances which the knowledge and experience of the manufacturer indicate as necessary for the particular class of goods which the rubber is destined to become. This mixing is done on rollers of exactly the same type as used in masticating, but the rolls are kept cooler. The rubber is put on the machine and the ingredients sprinkled on it as it passes through the rolls, they are folded between layers of the rubber, and, after repeated working through the rollers, become thoroughly incorporated and most intimately mixed into "dough" of which each factory has many types and the precise compositions of which are the secrets of each firm. The dough thus compounded is rolled up and stored for future use.

VULCANISATION.

22. Vulcanisation is the name given to the act of combining ndia-rubber and sulphur chemically into a new substance. There

are two methods of producing the desired result, known as the heat cure and cold cure, respectively.

IN THE HEAT CURE.

23. The raw rubber and finely powdered sulphur are mixed together intimately on a mixing or a masticating machine. If other ingredients are to be added to the rubber it is done at the same time that the sulphur is incorporated. Chemical union between the sulphur and the rubber takes place neither during this mixing nor afterwards, as long as the mixture is kept cold. If however, it be heated to about 300° F. chemical union takes place slowly and the new product, vulcanised rubber, is formed. By far the greater bulk of rubber is vulcanised in this way. The hot chambers in which the actual heating and vulcanisation are carried out are of several types, and differ in the way in which the heat is applied. Where pressure has to be exerted on the rubber during vulcanisation the goods are vulcanised in moulds, between large plates of iron, which are hollow and heated by steam. In other cases, large chambers heated by steam are used and into these the rubber goods, placed on trays and smothered in French chalk, are taken. Fabrics coated with rubber—such as sheeting and mackintosh cloth—are wound round a large iron drum and immersed in water, which under pressure is heated to the required temperature. Long tunnels, 50 or 60 feet long, dry heated by steam, are used for vulcanising hose pipe and lengths of tubing which cannot be coiled. The temperature is regulated so as to slowly rise to about 300° F., and after maintenance at that point for a period varying from half to three hours, it is slowly allowed to drop again. During vulcanisation a portion of the sulphur combines with the rubber and forms the new addition compound, which is quite distinct from raw india-rubber, and from which the sulphur cannot be removed by any known process. Although the whole of the rubber is acted upon by the sulphur to greater or lesser degree, the action is slow and the whole of the sulphur present is not used up during the short period that the vulcanisation lasts, and free uncombined sulphur remains disseminated throughout the vulcanised product. A prolonged period of heating during vulcanisation diminishes this excess of sulphur, and leads to the production of more highly vulcanised rubber. The more sulphur which vulcanised rubber has used and actually combined with, the darker and harder the product until the extremes of vulcanite and ebonite are reached. From partially vulcanised goods the excess of free sulphur can be chemically extracted, and this is one of the operations in "recovered" vulcanised rubber: the combined sulphur, however, remains always in the recovered rubber. The recovery of rubber, therefore, is an operation by which the mechanically mixed substances, such as the excess of sulphur and the fillings with which the rubber was mixed in manufacture, are wholly or partially removed, and the residue resulting is worked up into a form in which it can be blended with new rubber, and act as a substitute for a portion.

COLD CURE.

24. Although pure sulphur does not combine with india-rubber at a temparature below 270° F., yet a compound of sulphur with chlorine—namely, mono-chloride of sulphur—does react on rubber, and the sulphur is transferred from the chloride of sulphur to the rubber, and vulcanisation takes place rapidly and completely at ordinary temperatures. This action with pure chloride of sulphur is too violent; this agent is therefore diluted and a solution of 2-3% chloride of sulphur in carbon bisulphide is used. The article to be vulcanised is immersed in this solution, and left for a few minutes, the time varying with the thickness of the rubber; it is removed, drained, and finally washed with water. The chamber in which this dipping takes place must be specially arranged to prevent the fumes of the solution, which are poisonous and corrosive, coming into contact with the workmen. This cold cure is used for goods which from their nature would be damaged by exposure to the temperature required for heat vulcanisation, and also for goods in which the presence of uncombined or free sulphur is objectionable, or which have been made by accumulation of rubber by dipping in rubber solution, as is the case with teats for infants' bottles, and in some surgical goods.

SOLUTION MAKING.

25. In dissolving rubber for making solution or pastes for spreading on fabrics, benzole is the solvent generally used. The process is simple, the washed dry rubber is soaked in the solvent and then ground up with the solvent in enclosed boxes, in which are several pairs of small rollers which thoroughly mix the rubber and solvent, and according to the relative amounts of rubber and solvent produce a solution free from lumps. If a solution of plantation rubber be made by shaking rubber and benzole in a glass bottle a turbid instead of a transparent solution results. This is due to a small quantity of a resinous body which is always normally present in all Para rubber, and which is not soluble in benzole. The effect of the mechanical rolling in solution making in the factory, is to largely break up and incorporate the flakes of this resin and render the whole homogeneous and transparent. Thorough mastication of the rubber also tends to produce this same result, and rubber after complete mastication is far more inclined to dissolve to a clear solution in rubber solvents than simple sheet, biscuit, or crepe rubber. This point I mention because the solution of samples of rubber in solvents is one test of the purity of rubber, and the presence of this insoluble resin, which appears large in bulk, but which is in reality only a small fraction of a per cent., is apt to prove disconcerting to the person making the test.

FINAL MECHANICAL PROCESSES.

26. The detailed mechanical manufacture of the actual rubber goods of commerce can only have an indirect interest to the rubber grower; but though indirect, it is, I consider, sufficiently great to justify the inclusion of an account of some of these processes in

this report. Much of my time was spent in acquiring knowledge of these details in the various factories I visited. Three facts must be remembered in order to properly understand the final manufacture of rubber goods. The dough of masticated rubber, mixed with sulphur and other ingredients, is plastic and has lost the original elasticity of rubber. It can be cut and moulded, stamped into shapes, bent and twisted, just as putty, clay, or a dough of flour and water may. Rubber dough and masticated rubber are self adhesive, and cut surfaces can be joined firmly together by simple pressure, and if the surfaces be brushed over with benzole the pressure required to form a very firm junction is of the slightest. On heating the dough and masticated rubber which contains sulphur, a chemical change takes place and a chemical compound of rubber and sulphur is formed which possesses the original elasticity and toughness of the raw rubber, but in a greater and more perfect degree. This chemical change is called vulcanisation of the rubber, and it is the final process to which practically all manufactured rubber goods are put. It must never be forgotten that raw rubber and vulcanised rubber are quite different and distinct substances, their chemical compositions are different, their properties both physical and chemical are quite distinct, and moreover though the change from raw rubber to the sulphur compound of rubber—that is, vulcanised rubber—can be easily effected by simple mixing and heating to 300° F., the reverse process of removing the sulphur and reforming raw rubber has never yet been done.

27. The vulcanised rubber goods which the manufacturer turns out may be divided into three main classes—I, stamped and moulded goods; II, goods built up of rubber dough and other material; and III, sheeted and spread rubber goods.

STAMPED GOODS.

28. All solid rubber articles—such as heel pads, soles for shoes, vulcanite stoppers, rubber rings, washers, mats, buffers and rubber pads, billiard cushions, rubber tube, etc.,—are prepared direct from the dough by stamping them out by hand or by machines, coating them with french chalk to prevent adhesion, and then vulcanising simply by heating on trays or in iron moulds. The variety of goods of this kind is enormous and without limit, and doughs of most diverse composition from pure rubber and sulphur to mixtures where rubber is present in very small proportion, are used for this kind of work. This branch of the manufacture of rubber goods is as simple to understand as the art of the pastry cook, who stamps out fancifully shaped little cakes, or twists up curly bread, dredges with flour and bakes in an oven. The secrets are in the recipes for the dough, and the art in the manner of making the shapes and regulating the baking. There are many ingenious and complicated machines used to save labour, but some of the simplest articles no machine can yet produce, and hand labour has to be employed. Rubber rings of circular cross section, commonly called "umbrella rings," have all to be made up by hand. If stamped or moulded the strength is not to be relied upon. The mode of making is

ingenious. A long strip is cut from a thin sheet of dough, and this is cut into lengths of a few inches, not by simple cross diversions but by oblique cuts. These lozenge shaped strips are then wrapped round a smooth circular rod and the sloping ends pressed together. A band is thus formed round the rod and the line of junction of the two original ends of the strip passes obliquely across the band. The workman, or rather workwoman, then rolls up into a ring with her fingers this flat band, still upon the rod, and by rolling it backwards and forwards upon the rod makes a smooth ring of it. The object of cutting the strip with oblique ends—or "on the cross"—is now evident, because the line of original junction which naturally would would be the weakest place in the ring, is spread out over a considerable length of the ring and it is everywhere wrapped round and supported by whole and unjointed ayers of rubber, becoming thus nowhere more than a small portion of any part of the cross section of the ring. Screw stoppers for bottles are mechanically stamped out of a dough which contains a high proportion of sulphur and which gives a hard product on vulcanisation, the dough is stamped in two stages, first a simple cylindrical rod is made and cut lengths of this are then fed into a powerful press which produces the final shape. For large and awkwardly shaped goods, such as the outer covers for pneumatic tyres, specially devised iron moulds to completely encase the trye and exert pressure upon it during vulcanisation are prepared. These moulds are in several portions and have to be fitted round each tyre separately and the portions keyed into contact. Flexible rubber tubbing where the rubber is solid and not, as in hose piping associated with canvas, is squirted out of a machine provided with compound nozzles, the apertures in which are ring-shaped. The rubber dough is ejected through this annular orifice as a hollow tube which only requires heat vulcanisation for completion.

A detailed account of the mechanical difficulties encountered in this part of the work, and the way they are surmounted, would be of little use and certainly tedious; the principal underlying all processes is the same—namely, moulding plastic dough and then reproducing the elasticity and tenacity of the rubber goods by heat and vulcanisation.

29. Rubber goods that are "built up" fall naturally into two classes, according to their being pure dough or compounded with other materials, as in the case of outer covers for tyres, hose piping, rubber belting, etc. The general mode of treatment is the same in all cases, and it is a mixture of joinery and tailoring. The dough is soft and plastic and so can be rolled to any thickness, cut to any shape, and applied to the goods in any manner. The dough contains raw rubber and therefore is adhesive, cut edges of it can be pressed into contact and that with the greatest ease if the edges or surfaces are previously moistened with any rubber solvent. The tools necessary for use in this work are consequently of the simplest —a keen knife or stamps for cutting shapes, a squeejee for pressing surfaces into contact, and a pot of benzine with a piece of cloth as

a sponge for moistening, with this solvent, edges to be stuck together. The goods built up in this way are, as would be expected, of extremely diverse character, and in some instances most ingenious methods to overcome special difficulties are practised. The process of making india-rubber balls is a case in point. Rubber dough in the form of sheets is cut into oval pieces of precise size with a knife and a metal shape, the edges being cut bevelled. Three of these oval pieces are applied together by their edges which are firmly cemented with the assistance of a little benzole, forming very roughly a hollow ball. An aperture of about an inch in length is left between the edges of two of the pieces, a small lump of pure masticated rubber is stuck to the inside of one of the pieces, and the position of this indicated on the outside with a spot of paint. A pinch of ammonium carbonate is then put inside the ball, and after examining the joints inside the ball with the aid of a little electric glow lamp the aperture is sealed up. The balls are then put into moulds and vulcanised by heat. The object of the ammonium carbonate is here seen. This substance on heating to the temperature used in vulcanisation is completely vapourised and this vapour exerts some pressure inside the balls, blowing them out tightly against the spherical moulds in which they are being heated, rendering the shape exact to the mould and assisting in ensuring perfection of the joints, on cooling the solid ammonium carbonate is again reformed and the balls are limp and under no pressure when removed from the moulds. A hypodermic needle connected with air under pressure is then thrust into the ball at the point where the lump of raw rubber was stuck inside. The compressed air is turned on and the ball inflated to its proper size, as shown by a gauge. On withdrawing the needle the aperture left in the lump of rubber inside, which contained no sulphur and which is therefore unvulcanised and sticky, at once closes and seals up the hole, a dab of solution is pricked into the hole in the outer cover to close this up also, and the ball is ready for use, ready to be painted and enamelled in gaudy colours and sold as a toy, or to be covered with cloth and become a tennis ball for men. Most hollow air-tight rubber goods in one piece are prepared in this way, the presence of a lump inside may be taken as a certain indication of it. Hose pipes are constructed by being built up round iron tubes, 60-100 feet in length. Strips of canvas, coated with a film of rubber, layers of dough on convas, and again canvas coated with a film of rubber are wrapped simply, without any spiral twisting, in layers over the inner core: the layers are all stuck together and squeejeed into a firm union, and then vulcanised. To extract the inner iron tube from the vulcanised pipe air is forced in between this tube and the outer hose pipe, which can then be easily slipped off the iron tube.

SPREAD AND SHEETED GOODS.

30. This class includes all the waterproof fabrics from the coarse and heavy waterproof sheet of which the basis is a canvas, to the lightest and thinnest cloth for wearing apparel. This is one

of the very important uses of rubber and is responsible for the consumption of a great part of the fine Para imported. Here probably plantation rubber would be of great use, being pale in colour, clean and free from offensive odour, provided that the lasting properties of the rubber are not injured in the preparation

Fabrics are coated with rubber in two ways. The rubber may be made into dough by masticating and mixing with sulphur and other ingredients and spread in this condition on the fabric by means of heated rollers; or the rubber, sulphur and mixings are made into a paste with a rubber solvent and this paste is spread on to the fabric by the aid of rollers, and the solvent dried off by passing the fabric over plates heated by steam.

For vulcanisation, the heat cure, using steam or water, is usually adopted. The machinery necessary for spreading rubber is heavy and costly, the rolls are of polished steel about 2 feet in diameter and each machine has at least three, and may have four, rollers arranged vertically above each other on horizontal axes. The fabric is rolled over the top roller, round between this and the second, and even tension being thus given to the cloth, and finally it emerges between the second and third. The rubber as dough or paste is spread on to the fabric from the face of the third roller, as the cloth passes between it and the second. There are machines for spreading simultaneously on both surfaces of the cloth, and many different details in the actual mechanism of the spreading. The rolls are called calenders and the machines are very similar to the calendering machines used in paper manufacture.

31. There are many forms of india-rubber goods which cannot justly be placed under any of the three previous clauses, but which deserve some mention here, especially as they are made for the great part from rubber of the finest quality and for which plantation-grown rubber is at present never used.

CUT-THREAD AND SHEET.

32. Cut-thread is the name given to rubber in the form of thread, or strands of square cross section cut from solid sheets of rubber already vulcanised. This rubber thread which when fine is woven into elastic webbing, is all of the best possible quality, and special nerve, elastic and keeping properties are demanded. The amount of labour which is actually spent on the rubber would make it a false economy to use untried cheap rubber, and makers of cut-thread will not use at present plantation rubber for this process. Each manufactory has its own special methods for actually cutting the thread and details of the machines are jealously guarded as secrets. I was, however, admitted in several instances and saw rubber being actually cut into threads by multiple scissors and knives, the thread afterwards being powdered and spooled and wound into hanks. The details of the cutting I shall not attempt to describe.

Cut-sheet is made from large blocks or cylinders weighing about half a ton, the cutting being done by a blade four to six feet long, which is rapidly oscillating with a saw-like movement and which is well lubricated with water or soap and water. Sheets cut in this way show a fine striation due to the little ridges which mark the progress of the knife at each stroke across the block or cylinder. A good tobacco pouch is usually made from this cut-sheet and shows the appearance described. The most interesting feature in making cut-thread or sheet to the man interested in rubber is the process of preparation of the rubber into blocks ready for the knife. The utmost care must be taken in the preliminary washing, and if any grit be in the raw rubber the washed sheet is subjected to a final cleaning between smooth hardened steel rollers which crush the grains of sand which are then washed out. The rubber is then well masticated and mixed with sulphur and whatever other ingredients may be required. The rubber is then forced by hydraulic pressure into huge iron moulds which will contain sometimes as much as a ton of rubber and which are rectangular or cylindrical according to the type of machine which is to cut sheet from them. Special care has to be taken to prevent the inclusion of air bubbles in this block of prepared rubber. When rubber is compressed in this way into cylindrical moulds for manufacture of cut sheet an axle of steel is forced through the centre of the mass while still in the iron mould. The moulded mass has then been to be annealed by gentle heating and maintaining it at a moderate temperature for some little while. The next process is to harden the block by freezing for a week in a refrigerating room, where it remains after removal of the mould until wanted for use. The cutting edge of the knife, and the surface of the rubber, are plentifully lubricated with water during cutting, this also fulfils the further purpose of thawing the immediate surface of the rubber and bringing the rubber to a suitable condition of hardness for the operation. The sheets when cut must be carefully handled, being still soft and self adherent, unvulcanised, though perhaps containing mixed sulphur.

DIPPED GOODS.

33. There is still another mode of manufacture of hollow rubber goods which may be called the dipping process, it is simple in principle and very similar to the way in which the old-fashioned tallow dip candles were made. A thick rubber solution is prepared, usually of pure rubber and solvent, though pigments may be mixed with it. A mould representing the internal shape of the required article is dipped into this liquid and withdrawn. The solvent evaporates leaving a film of rubber on the moulds, the operation is repeated until the required thickness of rubber is accumulated. Any manipulation or cleaning of the edges is now carried out and the rubber still on the mould is vulcanised. Here the "cold cure" has to be adopted, since the rubber contains no sulphur already mixed, and the customary solution of 3 per cent. of sulphur chloride in carbon bisulphide is employed as previously described under the head of vulcanisation. Certain classes of surgical rubber goods are made in this fashion and india-rubber teats for feeding bottles are turned out by the thousand. A final dressing of rubber enamel

is often given to goods prepared in other ways, such as enemas and india-rubber balls, by painting with or dipping in a rubber solution heavily loaded with pigments.

ELECTRICAL USE.

34. Rubber as an insulator of wires for cable use is being rapidly discontinued, owing primarily to the high price of raw rubber. For sea cables rubber has never been much used, gutta percha of course being superior, but land cables carrying telephone wires and which at one time were insulated with rubber are now being largely insulated with dry paper. Heavy cables for electric light supply are demanding for use in their manufacture less and less rubber every year, its place being taken by papier-mâche and cellulose pulp. For the flexible wiring containing a single or a few strands of wire, such as are used in houses for electric bells, lights, and telephone communication, rubber is still employed, paper here is inadmissible because it is less flexible and also when exposed to the air becomes damp and an inefficient insulator. The wire is coated with raw unvulcanised rubber by wrapping a narrow strip, cut from thin sheet, round the wire and pressing the adhesive edges together. This is done by a machine which feeds the rubber slip from a spool on to a travelling wire, the pressing together of the edges is done by running the wire coated with the strip through guides and between wheels. Paper when used as an insulator is wound round the wire spirally. The use of rubber for electrical purposes in the form of ebonite fittings is considerable, but a great extension of the electrical application of rubber consequent on any reduction in the price of the raw material must not be expected.

THE INDIA-RUBBER MANUFACTURERS' ASSOCIATION.

35. This Association, which was formed seven years ago to promote the interest of the rubber trade and "especially with reference to legislation and to difficulties in the general conduct of the business," is one exclusively of firms possessing india-rubber works, and includes 25 of the india-rubber manufacturing firms of Great Britain. General meetings take place once a month in Manchester, and on June 21st and again on July 20th I attended the meetings and gave addresses on Plantation Rubber and the Progress of Rubber Planting in the East. Samples of washed plantation rubber and of rubber latex, both from Hevea braziliensis, and from Ficus elastica, were shown, and photographs to illustrate modes of tapping and the growth of the trees were exhibited and described. This opportunity of meeting the heads and representatives of large manufacturing interests, and of putting the problems of rubber cultivation and preparation before them from the planters' point of view, was of the greatest value, and the views which I had been gradually ascertaining were perfectly confirmed. At the same time, the interest taken in England in rubber growing was stimulated by having the conditions under which that work is done expounded. I should recommend that communication be established between the United Planters' Association and the As-

sociation of India-rubber Manufacturers, and that questions which may arise from time to time be freely discussed between the two Associations, and I am confident that any help which the India-rubber Manufacturers' Association could give, in this way, to rubber planting would be freely at the disposal of the United Planters' Association. The following is the name and address of the Secretary of the Association.

F. B. KNOTT, Esq., A.S.A.A.
2, Cooper Street, Manchester.

INFORMATION ABOUT THE MALAY PENINSULA IN LONDON.

36. At present there is considerable activity shown in London amongst controllers of capital in rubber planting in Ceylon and the Malay Peninsula, and every sign of still further advance in this direction. From the point of view of the future interests of the industry and the permanent welfare of this country, the greatest encouragement should be shown to capitalists who intend to actually open up country and plant, rather than make profit by company promotion. In this connection there is an unexpected difficulty in obtaining information in London about the Malay States, and the conditions under which land can be acquired, held, and utilised, for planting. This acts as a distinct check to that class of investor which is most to be encouraged. Cases of this came under my personal notice; copies of the Land Acts and Ordinances of the Malay States and of the rules under these Acts could only be obtained as a favour from the Colonial Office; conditions of labour supply and all details connected with the manner and cost of opening, and development of an estate at the present date, are difficult to obtain by the investing public, and steps might with advantage to this country be taken towards supplying the want, by the establishment of an office in London supplied with quite recent and reliable information on all matters relating to planting and agriculture in the Malay Peninsula.

P. J. BURGESS, M.A., F.C.S.,
Government Analyst, Singapore.

WATER AND ITS RELATION TO PLANT LIFE.

(*Continued from page 364.*)

Many and varied are the contrivances that regulate the passage of water through the plant, and while the structure of many plants favours the exit of the water that has been absorbed by the roots, others have developed various devices for reducing this loss to a minimum.

Those plants which have developed contrivances for expediting the exit of water, are known as hygrophytes, and are especially characteristic of hot moist regions: as a rule, they have a weakly developed root system, and are provided with an abundance of foliage, the leaves being generally large and thin, with numerous stomata, and sometimes provided with long dripping points, by means of which the water is rapidly drained off. In addition to their very numerous stomata, which as we have seen so materially assist in the process of transpiration, hygrophytes are often furnished with special epidermal organs—hydathodes—for excreting water. Residents in the tropics will have noticed that the forests are often dripping with moisture during the night and the early hours of the day, even in a comparatively dry season: this moisture which is generally believed to be dew, owes its origin, in part, to these special organs of evaporation; the excretion being most active during the night when, owing to the saturated state of the atmosphere, which is therefore unfavourable to transpiration, the plant becomes overcharged with moisture. These organs are commonly present on the leaves of aroids, and the blades of the Indian corn and other grasses.

Dry region plants, or xerophytes, are characteristic of regions where the external conditions are such as to limit the supply of water, or to accelerate its exit from the plant. The plants constituting the flora of such regions, have developed all manner of devices for effectually checking the loss of water, with the result that few districts are so dry as to be entirely destitute of vegetation.

The leaves of such plants are often few, and are generally extremely small, or, as in the case of the Cacti and some Euphorbias, entirely absent; thus diminishing the evaporating surface, and reducing the loss of water to a minimum: in such cases the stems are generally green and enormously swollen, and perform the functions of leaves. When present the leaves are often very thick and fleshy as in the Agave, or tough and leathery in texture as in many epiphytic orchids, or in the 'Rambong' (*Ficus elastica*) where transpiration is impeded owing to the increased thickness of the epidermis of the leaves, which is rendered almost imprevious to water.

Sometimes the leaves are covered with a dense felt of hairs as in the Castilloa, and the 'silver tree' of South Africa (*Leucadendron argenteum*) this covering protects the leaf against the too powerful rays of the sun, and to its presence the characteristic grey colouring of many desert plants is due. Many species of Acacias inhabiting the hot and dry regions of tropical Africa and Australia are provided with pinnate leaves; the leaflets being mobile and capable of closing together during the hotter part of the day when transpiration is greatest. There are many other adaptations for resisting the loss of water, such as the rolling up of the leaves as in some of the grasses, so as to prevent the under surface on which the stomata are absent to the rays of the sun; and the placing of the leaves edgewise as in the case of the *Eucalyptus* of Australia, so as to minimise the effect of the sun's rays; but the foregoing examples will show how perfectly plants have succeeded in accommodating themselves to their physical environment, by preventing excessive transpiration.

In addition to thus protecting themselves against excessive transpiration, plants inhabiting dry regions have generally a very well developed root system, the roots sinking into the soil to a great depth in search of moisture: they also exhibit various other modifications in their structure. Perhaps the most important of these modifications, is the development of water storing cells, which have the power of storing up water when the supply is temporarily increased, and yielding it up to the growing tissue when the supply from other sources falls short of the demand made upon it by the plant The leaves of *Agaves*, *Fourcroyas* and *Sansevierias*; the stems of *Cacti* and the pseudobulbs of epiphytic orchids, are chiefly made up of this aqueous tissue; the cells of which being gorged with water, constitute a reservoir from which the loss of water due to transpiration is made good. Owing to the presence of this water storing tissue, these plants can withstand long periods of drought without injury; the cut branches of *Cacti* for example, will remain alive for weeks or months, even when exposed to the sun, before the stored up water becomes exhausted.

A familiar example of a plant with water storage tissue, occurs in the case of the *Purslane* ("*Gelang Pasir*"), an exceedingly common, although harmless, weed on most estates, especially in the neighbourhood of cooly lines. It has small fleshy leaves which are used as a vegetable by the coolies, and bears little yellow flowers. The difficulty of eradicating this plant is known only too well to all planters, as, thanks to its special provision of water, each small piece of the plant allowed to remain on the ground after hoeing out the weeds, is generally able to re-establish itself before becoming desiccated: in fact, cultivation of the soil rather assists in spreading the plant than otherwise

As a rule, when the leaf surface is much reduced, the plant is armed with thorns: the terrible spines developed on *Cacti* and other xerophilous plants, serve as a protection against the depredations of herbivorous animals.

Xerophilous plants are of course most perfectly developed in hot deserts as for instance in parts of the United States, Mexico, the Sahara and parts of Australia; but also occur in the Artic regions (where absorption is limited by the prevailing low temperature) and in salt marshes. It may seem strange that the plants which form the mangrove swamps at the mouths of rivers, and on the sea shore, where there is an unlimited supply of water, should exhibit the same structural peculiarities as xerophilous or dry region plants: yet an examination of their organs show that they too have developed thick leaves, sometimes covered with hairs, are provided with water storing tissue, and in many respects agree with true xerophytes. The explanation of this is doubtless to be found in the fact that such plants find a difficulty in separating the water from the salt solution, and if free transpiration occurred, it would result in an accumulation of salt within the tissues of the plant which would prove injurious. A similar structure is characteristic of the plants inhabiting peat bogs, where the presence of large quantities of humous acids in the soil prevents free absorption : thus we find that among cultivated plants in this country, 'Rambong' (*Ficus elastica*)—whose leaves are protected against excessive transpiration by having an epidermis consisting of three layers—is better adapted to this class of soil than any other cultivated plant.

Plants inhabiting regions which have a well defined wet and dry season, as in parts of California and South Africa, and the shores of the Mediterranean, are known as tropophytes, and at the commencement of the dry season shed their leaves and thus protect themselves against excessive transpiration. In these countries a large number of plants develope bulbs or tubers which act as reservoirs; so that they may become completely dried up and experience extreme drought without injury, passing through the dry season in a dormant state, and bursting out into fresh growth when the conditions become favourable. Such plants include Yams, Lilies, Etc.

We see therefore, how perfectly plants have accommodated themselves to every physical environment, and how necessary it becomes to study in detail the conditions under which plants occur in nature, in order to cultivate them to the best advantage. As illustrating this, the Mexican rubber tree (*Castilloa spp.*) may be cited : this tree has its branches arranged in whorls, its leaves densely covered with hairs, and in many respects exhibits the peculiarities of a true xerophyte, and, as has been proved by experience, is totally unsuited to the hot moist conditions obtaining in the Malay Peninsula. On the other hand, the 'Para' rubber tree (*Hevea brasiliensis*) is almost a typical hygrophyte, having a large spreading crown, with an abundance of large thin leaves which favour rapid transpiration, and although likewise an alien has proved itself to be admirably adapted to the conditions obtaining in this country.

(*To be continued.*)

STANLEY ARDEN,

Superintendent, Experimental Plantations, F M.S.

ANONA PALUSTRIS.

The Alligator apple is one of the Anonas which occurs on muddy river-banks and such places in the West Indies and Brazil. It has long been cultivated in the Singapore Botanic Gardens but has never fruited. Mr. ARDEN sends a ripe fruit grown in the Batu Tiga gardens. Like the other anonas it is a large shrub or small tree with ovate rather stiff leaves. The fruit is 5 inches long and 4 inches through, oval in outline with low marked reticulations much like the bullock's heart (*A. squamosa*). The skin of the fruit yellowish green, the pulp very soft yellow acid and with a decidedly unpleasant flavour. The fruit seems to be hardly ever eaten even in its native country and indeed is said by some persons to be narcotic and dangerous so that it is more of a curiosity than an addition to our dessert.

TRADE IN STRAITS SETTLEMENTS IN 1904.

The Annual Report on the Exports from the Straits Settlements for last year which is just published contains for the first time the record of the export of Para rubber of which 88 piculs were exported.

Decreases are shown in Rice to the value of $4\frac{1}{2}$ million dollars; Pepper over $\frac{3}{4}$ million. Coffee over $520,000; Sago and Tapioca $912,000, while increases are recorded in Nutmegs $390,000, Tea $220,000 and Betel-nuts and Mace in smaller amount.

DETAILED EXPORTS.

SINGAPORE.

Exports of this class from Singapore valued $83\frac{1}{5}$ million dollars, a decrease of $5\frac{4}{5}$ million.

The largest falling-off is in Rice by nearly $4\frac{1}{2}$ million dollars; Pepper by over $\frac{3}{4}$ of a million, Beche-de-mer by over $600,000, Coffee by over $520,000, Sago and Tapioca taken together by $912,000, Opium by $300,000 and Medicine by over $210,000, followed by Padi, Spirits, Sugar, Live Animals, Lard, Chocolate and Cocoa.

The increases are chiefly seen in dry and salted fish by over $830,000, Sugar Candy by over $450,000, Nutmegs by nearly $390,000, Birdnests by over $270,000 and Tea by nearly $220,000, followed by Arecanuts, Mace and Tobacco and Cigars with smaller increases.

PENANG.

The Exports of this class from Penang valued nearly $20\frac{7}{10}$ million dollars, a decrease of over $4\frac{3}{4}$ million

Rice alone accounts for a decline of $3\frac{1}{10}$ million dollars, Opium of $730,000, Arecanuts of nearly $645,000, Live Animals and Sugar of about $340,000 each, and Nutmegs of over $220,000, followed by Dry and Salted Fish, Curry Stuffs, Malt Liquors and Sago with smaller declines.

Cigars and Tobacco showed increased values of over a million dollars, Pepper of over $400,000 and Coffee of over $120,000.

MALACCA.

Malacca with an export value of over $2\frac{7}{10}$ million dollars gave a decrease of about $11,000.

Tapioca fell off by $240,000 and Rice by $40,000, but the value of Swine exported rose by $180,000 and Opium by $72,000.

THE COLONY.

The falling-off in Coffee was most marked from Bali, 42,000 piculs received in 1903 declining to 14,600 in the year under review and the import of over 50,000 piculs from the Federated Malay States also showing a decline of 10,000.

Of Pearl Sago 27,000 piculs were sent to the United Kingdom, an increase of 5,000, to the Continent of Europe about 9,000 piculs, a decrease of 1,000, the other exports being chiefly to Asiatic places.

Of Flake Tapioca the United Kingdom received 104,000 piculs, a decrease of nearly 20,000, and France 52,000 piculs, a decrease of 19,000, while of the Flour description to the United Kingdom 249,000 piculs were sent, a decrease of 27,000, to the United States 37,500, a decrease of 19,000, to France about 10,000 more than in 1903, and to Hongkong, 24,000 or much the same as in the previous year.

Of Tapioca from Malacca, Singapore recorded 354,500 piculs, of all kinds, from Johore 62,600 piculs, from Java 46,400, and from the Negri Sembilan 36,200 piculs, being decreases of 16,000 piculs and 14,300 piculs from Malacca and Johore respectively, an increase of 34,000 piculs from Java and a decrease of 12,000 piculs from the Negri Sembilan.

Pearl Tapioca exported to the United Kingdom rose to 97,000 piculs, an increase of 3,000, and to Denmark 55,000, an increase of 28,000, but fell to 55,000 in the case of Australia, a decrease of 15,000.

Imports of Arecanuts from Johore fell by 37,000 piculs, but rose by nearly 50,000 from Sumatra and by 46,000 from Acheen.

RAW MATERIALS.

SINGAPORE.

Singapore shows a total export of nearly $84\frac{3}{5}$ million dollars, represented in Sterling by over £8,100,000, being a decrease of nearly $6\frac{2}{5}$ million dollars, but an increase in Sterling of over £100,000.

In the Produce Class the heavy declines were Gutta Percha by more than $3\frac{1}{2}$ million dollars, Gambier by nearly $2\frac{9}{10}$ million, Rattans by over $1\frac{1}{2}$ million, Copra by over 1 million, Copal, Coconut Oil and Planks with decrease of about $200,000 each, and Kachang Oil and Sandalwood with declines of $143,000 and $130,000 respectively.

Borneo Rubber increased, however, by nearly $1\frac{1}{5}$ million dollars followed by Jelutong and Inferior Rubbers with an increase of $225,000, other increases by smaller amounts being Crude Oil, Benzine, Nuts and Seeds, etc.

PENANG.

Produce slightly decreased, Copra falling by $490,000, and Gutta Percha by $70,000, met, however, by an increase in India Rubber of close on $800,000.

THE COLONY.

The decrease in Copra is seen by reduced quantities of 74,000 piculs from Bali and the Celebes, 37,000 piculs from the Natunas Islands, and also decreases from other places except Dutch Borneo, which sent 34,000 piculs more.

Reduced quantities were sent to Russia by 173,000 piculs, t Spain by 83,000 and to Belgium by 33,000 piculs, but France showed the substantial increase of 113,000 piculs.

Imports of Gambier from Johore fell by 88,000 piculs and fro Rhio by 8,000, but rose from all other principal sources.

To the United Kingdom 13,000 more piculs were sent, to Franc 9,000 more, to Italy 6,000 more and to Calcutta 4,000 more, but t the United States there was a fall of 34,000 piculs and to Java c 5,000.

Gutta Percha, exports fell off to the United Kingdom by 14,0 piculs, but increased to Germany by 2,400.

Para Rubber showed 88 piculs sent off to the United Kingdo and Ceylon.

Jelutong, Rubber, Gutta Soh and other low classes totall 184,000 piculs, increased quantities being sent to the United Kin dom by 6,000 piculs, to the United States by 20,000, to France b 5,000 and to Germany by 3,000.

Of this Class from Dutch Borneo 136,000 piculs were receive a marked increase and supplies from Sarawak also recorded more

India and Borneo Rubbers exported recorded 31,600 piculs, c which 13,000 piculs were sent to the United Kingdom, 8,600 picu to the United States and 6,000 to France.

Gum Copal sent out recorded 111,000 piculs or slightly under t 1903 exports, of which the United Kingdom received 27,000 picul a decrease of 17,000, the United States of America 54,000 picul an increase of 9,000 and Germany 12,000, an increase of 3,000.

Decreased quantities were received from the Celebes and Nethe lands Archipelago.

The heavy decrease of 95,000 piculs in Rattan exports is a counted for by the following decreases in supplies :—Dutch Born by 27,000 piculs, Celebes by the same amount, Pahang by 16,0 and Tringganu by 7,000.

GOW, WILSON & STANTON, LIMITED.
India Rubber Market Report.

13, Rood Lane, London, E.C.
19*th December*, 1905.

At to-day's auction, 77 packages of Ceylon and Straits Settl ments Plantation grown rubber were offered, 66 of which we sold.

The aggregate quantity amounted to nearly four tons and thr quarters, Ceylon contributing 2½ tons and Straits rather less th 2¼ tons.

The Auction was characterised by good competition, fine quality articularly being in request at up to 6/1¼ per lb. There was only small quantity of scrap offering, and this was mostly disposed off from 3/- per lb. for a small bag of unattractive quality up to 5/3½ r a fine parcel of Ceylon.

AVERAGE PRICE OF CEYLON AND STRAITS SETTLEMENTS PLANTATION RUBBER.

66 packages at 5/10¼ per lb., against 66 packages at 5/9¼ per lb last auction. Particulars and prices as follows.—

Ceylon.

MARK.	QUANTITY.	DESCRIPTION.	PRICE PER LB.
lakande	2 cases	Fine small pale and darkish biscuits	6/1¼
Do.	1 case	Good palish scrap	5/3½
eatherley	6 cases	Fine pale biscuits, little mouldy	6/1½
Do.	5 cases	Fine scrap	5/3½
Do.	1 case	Fair darkish scrap	5/-
kakotua	3 cases	Fine palish cloudy biscuits	6/1¼
Do.	1 case	Good dark biscuits (mouldy)	6/0¾
Do.	4 cases	Good palish scrap	5/3
Do.	1 case	Good ball scrap	4/3
apolakanda P K A I	8 cases	Very fine large biscuits, few palish	6/1
Do. B I	4 cases	Fine dark scrap	5/1½
iyanakande	5 cases	Fine hard pale washed worm	Bought in
B	2 cases	Do. do.	do.
MM	1 case	Good pale aud darkish biscuits	6/-
Do.	1 bag	Good scrap and cuttings	4/9

Straits Settlements.

MARK.	QUANTITY.	DESCRIPTION.	PRICE PER LB.
L & P M S	1 case	Very fine pale washed ribbon	6/1¼
Do.	3 cases	Do. (thicker)	6/1
Do.	3 cases	Very fine pale washed crape	6/1¼
Do.	2 cases	Very fine amber sheet	6/1¼
Do.	1 bag	Good sheet scrap	5/0½
S R R	3 cases	Fine clean pressed sheet	6/1
S S R	1 case	Dark scrap	3/4
dd E	1 case	Good palish sheet	6/1
AR	4 cases	Very fine palish scored sheet	6/1¼
its o.	1 case	do. do. little darker	6/1¼
o.	1 case	Pressed scrap and Rambong sheet	4/7
BC	1 case	Good small darkish biscuits	6/1
o.	1 bag	Rejected biscuits and scrap	3/-

MARK.	QUANTITY.	DESCRIPTION.	PRICE PER LB.
J B 2	1 case	Good hard pressed scrappy sheet ...	4/11½
Do.	1 case	do. do. little darker	4/11½
B N S	1 case	Very fine thin pale sheet ...	6/1½ bid
Do.	1 case	do. do. little darker ...	do.
Do.	1 case	do. do. and biscuits ...	do.
Do.	1 case	Very fine pale scrap ...	5/3
Do.	1 case	Fine scrap ...	5/1½
SP	1 case	Good palish biscuits (mouldy) ...	6/1
Do.	1 case	Good scrap and rejected biscuits ...	Bought in

ASSAM RUBBER.

There were also included 9 bales of Assam Rubber, which comprised a very fine invoice of clean plantation quality, which realised from 4/9 to 4/10 per lb.

REGISTER OF RAINFALL AT NEGRI SEMBILAN HOSPITALS, FOR NOVEMBER, 1905.

Date.	Seremban.		K. Pilah.		Tampin.		Jelebu.		Port Dickson.		Mantin.	
	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.	In.	dcs.
1	1	18	...	...	...	...	...	...	1	50	...	47
2	...	21	...	...	...	20	...	...	...	...	...	92
3	...	50	...	...	...	...	...	40	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	11
5	1	05	...	07		...	...	76	...	10	...	85
6	...	55	...	...	...	72	...	...	...	...	...	88
7	...	05	...	16	...	35	...	05	1	10	...	05
8	...	34	...	50	...	09	...	02	...	50	...	03
9	...	33	...	...	...	82	1	08	...	90	...	31
10	...	20	...	12	...	...	...	03	1	65	...	...
11	...	79	...	...	...	...	...	12	...	10	...	70
12	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	..	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	..	15	...	...
15	...	10	...	...	...	...	...	02	...	...	...	...
16	...	...	...	11	...	...	...	...	...	02	...	09
17	...	...	...	...	...	...	.	...	...	...	...	03
18	...	14	...	85	...	30	...	30	...	23	...	08
19	...	31	...	70	1	46	...	34	...	95	...	20
20	...	86	1	23	...	26	...	68	...	40	...	27
21	...	30	...	96	...	60	...	73	...	17	...	26
22	3	36	...	...	...	...	...	...	...	13	...	10
23	...	31	2	03	2	00	...	58	...	82	1	32
24	...	...	...	07	...	10	...	02	...	...	...	...
25	...	21	1	46	...	15	...	30	...	...	...	57
26	...	...	...	65	...	25	...	20	...	27	...	...
27	...	84	[illegible]	13	...	30	...	47	...	65	...	96
28	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...
30	1	94	1	23	...	62	...	85	2	32	2	63
							...					
Total	13	57	10	27	8	21	6	95	11	96	10	83

State Surgeon's Office,
Seremban, 11*th December,* 1905.

R. VAN GEYZEL,
Apothecary.

SINGAPORE MARKET REPORT.

November, 1905.

Articles.	Quantity sold.	Highest price.	Lowest price.	
	Tons.	$ c.	$ c.	
Coffee—Palembang	...	24.00	24.00	
Bali	...	22.50	22.50	
Liberian	3	24.50	22.00	
Copra	2,535	7.47½	7.00	
Gambier	3,205	8.10	7.87½	
Cube Gambier, Nos. 1 & 2	210	11.75	11.00	
Gutta Percha, 1st quality	...	300.00	150.00	
Medium	...	200.00	90.00	
Lower	...	80.00	12.00	
Borneo Rubber 1, 2, and 3	...	130.00	90.00	
Gutta Jelutong	...	6.12½	5.25	
Nutmegs, No. 110's	...	32.00	29.00	
No. 80's		55.00	50.00	
Mace, Banda	...	82.00	78.00	
Amboyna	...	58.00	54.00	
Pepper, Black	499	24.75	23.50	
White (Sarawak)	710	34.75	33.00	
Pearl Sago, Small	205	...	...	
Medium	20	...	...	
Large	...	...	...	
Sago Flour, No. 1	2,695	3.12½	2.80	
No. 2	355	.90	.87½	
Flake Tapioca, Small	757	7.62½	6.60	Closing fair.
Medium	85	...	...	
Pearl Tapioca, Small	114	6.30	6.00	
Medium	552	6.45	6.00	
Bullet	...	...	...	
Tin	2,775	84.00	80.87½	

SINGAPORE MARKET REPORT.

December, 1905.

Articles.	Quantity sold.	Highest price.	Lowest price.	
	Tons.	$ c.	$ c.	
Coffee—Palembang	...	24.00	24.00	
Bali	...	20.50	20.50	
Liberian	31	23.00	22.00	
Copra	1,950	7.60	7.00	
Gambier	2,883	8.00	7.80	
Cube Gambier, Nos. 1 and 2	155	12.75	11.25	
Gutta Percha, 1st quality	...	300.00	150.00	
Medium	...	200.00	90.00	
Lower ...	...	80.00	12.00	
Borneo Rubber 1, 2, and 3	...	138.00	89.00	
Gutta Jelutong	...	5.87½	5.50	
Nutmegs, No. 110's ...	...	29.50	29.00	
No. 80's	...	50.00	49.00	
Mace, Banda	...	78.00	76.00	
Amboyna	...	54.00	52.00	
Pepper, Black	966	24.00	21.37½	
White (Sarawak)	240	33.25	31.50	
Pearl Sago, Small	335	4.53	4.25	
Medium ...	...	...	...	
Large	...	...	...	
Sago Flour, No. 1	2,925	3.05	2.80	
No. 2	65	0.90	0.85	
Flake Tapioca, Small ...	438	8.05	7.80	Closing fair.
Medium	66	8.05	8.00	
Pearl Tapioca, Small ...	202	7.40	6.25	
Medium	294	7.80	6.25	
Bullet	...	...	...	
Tin	2,865	88.75	83.75	

Export Telegram to Europe and America.

Fortnight ending 15th November, 1905.

Wired at 2.45 P.M. on 16th December, 1905.

				Tons.
Tin	Str.	Singapore and Penang to	United Kingdom &/or	1,575
Do.	,,	Do.	U. S. A.	280
Do.	,,	Do.	Continent	572
Gambier	,,	Singapore	Glasgow	...
Do.	,,	Do.	London	100
Do.	,,	Do.	Liverpool	675
Do.	,,	Do.	U. K. &/or Continent	360
Cube Gambier	,,	Do.	United Kingdom	120
Black Pepper	,,	Do.	Do.	45
Do.	,,	Penang	Do.	...
White Pepper	,,	Singapore	Do.	125
Do.	,,	Penang	Do.	10
Pearl Sago	,,	Singapore	Do.	80
Sago Flour	,,	Do.	London	360
Do.	,,	Do.	Liverpool	1,500
Do.	,,	Do.	Glasgow	125
Tapioca Flake	,,	Singapore & Penang	United Kingdom	260
T. Pearl & Bullets	,,	Do.	Do.	160
Tapioca Flour	,,	Penang	Do.	340
Gutta Percha	,,	Singapore	Do.	125
Buffalo Hides	,,	Do.	Do.	90
Pineapples	,,	Do.	Do.	cases 2,750
Gambier	,,	Do.	U. S. A.	30
Cube Gambier	,,	Do.	Do.	65
Black Pepper	,,	Do.	Do.	5
Do.	,,	Penang	Do.	...
White Pepper	,,	Singapore	Do.	5
Do.	,,	Penang	Do.	...
T. Pearl	,,	Singapore & Penang	Do.	220
Nutmegs	,,	Do.	Do.	12
Sago Flour	,,	Singapore	Do.	...
Pineapples	,,	Do.	Do.	cases 1,500
Do.	,,	Do.	Continent	,, 2,500
Gambier	,,	Do.	S. Continent	140
Do.	,,	Do.	N. Continent	300
Cube Gambier	,,	Do.	Continent	140
Black Pepper	,,	Do.	S. Continent	200
Do.	,,	Do.	N. Continent	...
Do.	,,	Penang	S. Continent	20
Do.	,,	Do.	N. Continent	...
White Pepper	,,	Singapore	S. Continent	20
Do.	,,	Do.	N. Continent	70
Do.	,,	Penang	S. Continent	...
Do.	,,	Do.	N. Continent	...
Copra	,,	Singapore & Penang	Marseilles	200
Do.	,,	Do.	Odessa	2,800
Do.	,,	Do.	Other South Continent	1,100
Do.	,,	Do.	N. Continent	900
Sago Flour	,,	Do.	Continent	1,150
Tapioca Flake	,,	Singapore & Penang	Do.	110
Do. Pearl	,,	Do.	Do.	...

				Tons
Tapioca Flake	Str.	Singapore & Penang	U. S. A.	35
Gambier	,,	Do.	Do	...
Cube Gambier	,,	Do.	Do.	...
T. Flake and Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	...
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	...
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	...
Pineapples	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Copra	,,	Singapore	England	100

1,650 tons Gambier }
320 ,, Black Pepper } Contracts.

Export Telegram to Europe and America.

Fortnight ending 30th November, 1905.

Wired at 4.45 P.M. on 1st December 1905.

				Tons.
Tin	Str.	Singapore & Penang to	United Kingdom &/or	2,251
Do.	,,	Do.	U. S. A.	110
Do.	,,	Do.	Continent	145
Gambier	,,	Singapore	Glasgow	...
Do.	,,	Do.	London	175
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	U. K. &/or Continent	550
Cube Gambier	,,	Do.	United Kingdom	10
Black Pepper	,,	Do.	Do.	120
Do.	,,	Penang	Do.	...
White Pepper	,,	Singapore	Do.	220
Do.	,,	Penang	Do.	10
Pearl Sago	,,	Singapore	Do.	25
Sago Flour	,,	Do.	London	250
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	Glasgow	...
Tapioca Flake	,,	Singapore & Penang	United Kingdom	375
T. Pearl & Bullets	,,	Do.	Do.	250
Tapioca Flour	,,	Penang	Do.	480
Gutta Percha	,,	Singapore	Do.	55
Buffalo Hides	,,	Do.	Do.	25
Pineapples	,,	Do.	Do.	cases 3,750
Gambier	,,	Do.	U. S. A.	...
Cube Gambier	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Singapore	Do.	...
Do.	,,	Penang	Do.	...
T. Pearl	,,	Singapore & Penang	Do.	...
Nutmegs	,,	Do.	Do.	...

					Tons.
Sago Flour	Str.	Singapore	U. S. A.		...
Pineapples	,,	Do.	Do.	cases	400
Do.	,,	Do.	Continent		2,750
Gambier	,,	Do.	S. Continent		150
Do.	,,	Do.	N. Continent		490
Cube Gambier	,,	Do.	Continent		110
Black Pepper	,,	Do.	S. Continent		40
Do.	,,	Do.	N. Continent		5
Do.	,,	Penang	S. Continent		...
Do.	,,	Do.	N. Continent		...
White Pepper	,,	Singapore	S. Continent		15
Do.	,,	Do.	N. Continent		50
Do.	,,	Penang	S. Continent		...
Do.	,,	Do.	N. Continent		...
Copra	,,	Singapore & Penang	Marseilles		220
Do.	,,	Do.	Odessa		680
Do.	,,	Do.	Other S. Continent		..
Do.	,,	Do.	N. Continent		400
Sago Flour	,,	Do.	Continent		180
Tapioca Flake	,,	Do.	Continent		85
Tapioca Pearl	,,	Do.	Continent		100
Do. Flake	,,	Do.	U. S. A.		...
Gambier	,,	Do.	Do		...
Cube Gambier	,,	Do.	Do.		..
T. Flake and Pearl	,,	Do.	Do.		...
Sago Flour	,,	Do.	Do.		...
Gambier	,,	Do.	S. Continent		...
Copra	,,	Do.	Marseilles		...
Black Pepper	,,	Do.	S. Continent		...
White Pepper	,,	Do.	Do.		...
Do.	,,	Do.	U. S. A.		...
Pineapples	,,	Do.	Do.		...
Nutmegs	,,	Do.	Do.		...
Black Pepper	,,	Do.	Do.		...
Do.	,,	Penang	Do.		...
White Pepper	,,	Do.	Do.		...
T. Flake & Pearl	,,	Do.	Do.		...
Nutmegs	,,	Do.	o.		...
Copra	,,	Singapore	England		100

1 600 tons Gambier } Contracts.
170 ,, Black Pepper }

Export Telegram to Europe and America.

For Fortnight ending 15th December, 1905.

Wired at 3 p. m. on 16th December, 1905.

				Tons.
Tin	Str.	Singapore & Penang	to United Kingdom &/or	1,375
Do.	,,	Do.	U. S. A.	531
Do.	,,	Do.	Continent	470
Gambier	,,	Singapore	Glasgow	...
Do.	,,	Do.	London	25
Do.	,,	Do.	Liverpool	700
Do.	,,	Do.	U. K. &/or Continent	25
Cube Gambier	,,	Do.	United Kingdom	60
Black Pepper	,,	Do.	Do.	50
Do.	,,	Penang	Do.	10
White Pepper	,,	Singapore	Do.	80
Do.	,,	Penang	Do.	...
Pearl Sago	,,	Singapore	Do.	15
Sago flour	,,	Do.	London	100
Do.	,,	Do.	Liverpool	1,600
Do.	,,	Do.	Glasgow	150
Tapioca Flake	,,	Singapore & Penang	United Kingdom	420
T. Pearl & Bullets	,,	Do.	Do.	625
Tapioca Flour	,,	Penang	Do.	300
Gutta Percha	,,	Singapore	Do.	85
Buffalo Hides	,,	Do.	Do.	130
Pineapples	,,	Do.	Do.	cases 11,500
Gambier	,,	Do.	U.S.A.	75
Cube Gambier	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Singapore	Do.	5
Do.	,,	Penang	Do.	...
T. Flake & Pearl	,,	Singapore & Penang	Do.	200
Nutmegs	,,	Do.	Do.	9
Sago Flour	,,	Singapore	Do.	100
Pineapples	,,	Do.	Do.	cases 1,000
Do.	,,	Do.	Continent	5,750
Gambier	,,	Do.	South Continent	110
Do.	,,	Do.	North Continent	675
Cube Gambier	,,	Do.	Continent	50
Black Pepper	,,	Do.	South Continent	100
Do.	,,	Do.	North Do.	100
Do.	,,	Penang	South Do.	10
Do.	,,	Do.	North Do.	...
White Pepper	,,	Singapore	South Do.	40
Do.	,,	Do.	North Do.	110
Do.	,,	Penang	South Do.	...
Do.	,,	Do.	North Do.	...
Copra	,,	Singapore & Penang	Marseilles	200
Do.	,,	Do.	Odessa	...
Do.	,,	Do.	Other South Continent	680
Do.	,,	Do.	North Continent	1,950
Sago Flour	,,	Do.	Continent	825
Tapioca Flake	,,	Singapore & Penang	Do.	180
Tapioca Pearl	,,	Do.	Do.	360
Do. Flake	,,	Do.	U. S. A.	...

				Tons.
Gambier	Str	Singapore	U. S. A.	...
Cube Gambier	,,	Do.	Do.	...
T. Flake and Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	...
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	...
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	...
Pineapples	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Do.	Do.	...
T. Flake and Pearl	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do	...

1,250 tons Gambier }
375 ,, Black Pepper } Contracts

Export Telegram to Europe and America.

For Fortnight ending 31st December, 1905.

Wired at 3 p. m. on 2nd January, 1906.

Tin	Str.	Singapore & Penang to	United Kingdom &/or	1,481
Do.	,,	Do.	U. S. A.	860
Do.	,,	Do.	Continent	180
Gambier	,,	Singapore	Glasgow	...
Do.	,,	Do.	London	150
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	U. K. &/or Continent	140
Cube Gambier	,,	Do.	United Kingdom	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Singapore	Do.	140
Do.	,,	Penang	Do.	...
Pearl Sago	,,	Singapore	Do.	...
Sago Flour	,,	Do.	London	...
Do.	,,	Do.	Liverpool	...
Do.	,,	Do.	Glasgow	25
Tapioca Flake	,,	Singapore & Penang	United Kingdom	85
T. Pearl & Bullets	,,	Do.	Do.	50
Tapioca Flour	,,	Penang	Do.	80
Gutta Percha	,,	Singapore	Do.	55
Buffalo Hides	,,	Do.	Do.	25
Pineapples	,,	Do.	Do.	cases 10,250
Gambier	,,	Do.	U. S. A.	375
Cube Gambier	,,	Do.	Do.	10
Black Pepper	,,	Do.	Do.	10
Do.	,,	Penang	Do.	30
White Pepper	,,	Singapore	Do.	40
Do.	,,	Penang	Do.	...
T. Flake & Pearl	,,	Singapore & Penang	Do.	70
Nutmegs	,,	Do.	Do.	18
Sago Flour	,,	Singapore	Do.	200
Pineapples	,,	Do.	Do.	900

				Tons.
Pineapples	Str.	Singapore	Continent	4,000
Gambier	,,	Do.	S. Continent	...
Do.	,,	Do.	N. Continent	225
Cube Gambier	,,	Do.	Continent	65
Black Pepper	,,	Do.	S. Continent	20
Do.	,,	Do.	N. Continent	...
Do.	,,	Penang	S. Continent	...
Do.	,,	Do.	N. Continent	...
White Pepper	,,	Singapore	S. Continent	5
Do.	,,	Do.	N. Continent	25
Do.	,,	Penang	S. Continent	...
Do.	,,	Do.	N. Continent	...
Copra	,,	Singapore & Penang	Marseilles	50
Do.	,,	Do.	Odessa	...
Do.	,,	Do.	Other S. Continent	300
Do.	,,	Do.	N. Continent	760
Sago Flour	,,	Singapore	Continent	160
Tapioca Flake	,,	Singapore & Penang	Do.	150
Do. Pearl	,,	Do.	Do.	300
Do. Flake	,,	Do.	U. S. A.	...
Gambier	,,	Do.	Do.	...
Cube Gambier	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Sago Flour	,,	Do.	Do.	...
Gambier	,,	Do.	S. Continent	...
Copra	,,	Do.	Marseilles	...
Black Pepper	,,	Do.	S. Continent	...
White Pepper	,,	Do.	Do.	...
Do.	,,	Do.	U. S. A.	...
Pineapples	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Black Pepper	,,	Do.	Do.	...
Do.	,,	Penang	Do.	...
White Pepper	,,	Do.	Do.	...
T. Flake & Pearl	,,	Do.	Do.	...
Nutmegs	,,	Do.	Do.	...
Copra	,,	Singapore	England	...

1,650 tons Gambier }
675 ,, Black Pepper } Contracts.

Singapore.

Abstract of Meteorological Readings for the month of November, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·939	134·2	79·1	86·7	73·8	12·9	76·9	·864	75·3	82	N.E.	9·18	1·73

A. B. LEICESTER,
Meteorological Observer.

D. K. McDOWELL,
Principal Civil Medical Officer, S. S.

KANDANG KERBAU HOSPITAL OBSERVATORY,
SINGAPORE, 13*th December*, 1905.

Singapore.

Abstract of Meteorological Readings for the month of December, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·909	140·8	79·6	87·4	73·5	13·9	77·2	·883	75·5	81	N.E.	11·04	4·13
Botanic Gardens	...	...	...	...	...	...	...	...	...	...		...	...

A. B. LEICESTER,

Meteorological Observer.

D. K. McDOWELL,

Principal Civil Medical Officer, S. S.

Kandang Kerbau Hospital Observatory,

SINGAPORE, 12*th January*, 1906.

Penang.

Abstract of Meteorological Readings in the Prison Observatory for the month of November, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Mean Maximum.	Mean Minimum.	Mean Range.	Mean Wet Bulb.	Mean Vapour Tension.	Mean Dew Point.	Mean Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	°F	%		Ins.	Ins.
Criminal Prison Observatory	29·895	149·1	81·7	89·4	74·4	15·0	75·6	·783	70·45	69	S.W.	8·20	2·38

COLONIAL SURGEON'S OFFICE,
PENANG, 11*th December,* 1905.

M. E. SCRIVEN,
Assistant Surgeon.

S. LUCY,
Acting Colonial Surgeon, Penang.

Penang.

Abstract of Meteorological Readings in the Prison Observatory for December, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Mean Maximum.	Mean Minimum.	Mean Range.	Mean Wet Bulb.	Mean Vapour Tension.	Mean Dew point.	Mean Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	°F	%		Ins.	Ins.
Criminal Prison Observatory	29·888	152·3	81·3	90·6	74·5	16·1	75·9	·798	70·44	69	N. W.	5·10	1·26

Colonial Surgeon's Office,
PENANG, 10*th January*, 1906.

M. E. SCRIVEN,
Assistant Surgeon.

S. LUCY,
Acting Colonial Surgeon Penang.

Malacca.

Abstract of Meteorological Readings for the month of November, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	Ins.	°F	°F	°F	°F	°F	°F	°F	%	%		Ins.	Ins.
Durian Daun Hospital ...	29·830	160·1	83·3	89·6	74·2	14·9	80·3	998	7·17	87	N.	7·68	1·60

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Colonial Surgeon's Office,
MALACCA, 21*st December*, 1905.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of November, 1905.

DISTRICT.	Maximum in Sun.	Temperature.				Hygrometer.			Total Rainfall.	Greatest rainfall during 24 hours.
		Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	154	80·89	91	71	20	77·06	380	84	20·70	4·03
Kuala Kangsar ...	...	81·17	92	69	23	76·41	847	79	6·95	1·72
Batu Gajah ...	162	80·27	92	71	21	75·86	837	81	15·42	2·97
Gopeng ...	...	80·50	92	65	27	76·28	851	81	12·07	2·52
Ipoh ...	...	81·35	92	73	19	78·42	934	88	13·87	2·60
Kampar ...	...	...	...	71	...	...	...	...	24·66	3·55
Teluk Anson ...	...	80·48	92	72	20	76·99	882	85	12·84	1·79
Tapah ...	...	80·38	91	69	22	76·51	863	84	20·77	3·13
Parit Buntar ...	...	82·34	91	71	20	76·28	826	75	5·20	1·30
Bagan Serai ...	...	81·69	91	68	23	76·95	864	80	14·90	4·80
Selama ...	...	81·39	91	71	20	77·16	877	82	9·26	1·60

STATE SURGEON'S OFFICE,

TAIPING, 11*th December*, 1905.

M. J. WRIGHT,

State Surgeon, Perak.

Perak.

Abstract of Meteorological Readings in the various Districts of the State for the month of December, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping	...	154	80·44	91	69	22	76·78	874	...	85	...	16·38	3·15
Kuala Kangsar ...	...	...	80·94	93	68	25	76·47	852	...	80	...	10·06	2·47
Batu Gajah ...	...	164	81·53	92	70	22	76·06	826	...	77	...	6·99	1·32
Gopeng ...	...	...	80·32	92	66	26	76·00	842	...	81	...	8·53	2·35
Ipoh ...		...	81·56	92	74	18	77·94	909	...	85	...	5·94	1·02
Kampar ...	...	...	...	...	70	...	...	...	...	...	..	5·93	1·30
Teluk Anson ...	...	...	81·38	92	70	22	77·40	887	...	83	...	11·36	2·30
Tapah ...	...	...	80·54	91	66	25	76·64	866	...	83	...	9·99	2·01
Parit Buntar ...	...	...	82·25	90	71	19	76·83	850	...	78	...	3·97	1·70
Bagan Serai ...	...	...	81·62	91	70	21	77·09	870	...	81	...	6·79	1·35
Selama ...	...	...	81·17	91	69	22	77·00	874	...	83	...	10·76	2·80

STATE SURGEON'S OFFICE,
TAIPING, 11*th January*, 1906.

M. J. WRIGHT,
State Surgeon.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of September, 1905.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·885	150·2	79·7	89·1	71·3	17·8	75·9	0·826	73·4	81	Calm.	5·89	0·98
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	5·78	1·35
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	7·92	2·32
,, Klang	...	...	...	87·2	70·3	16·9	...	...	...	...	...	7·95	1·92
,, Kuala Langat	...	...	...	...	...	...	...	...	...	...	...	11·18	1·94
,, Kajang	...	...	...	89·8	71·9	17·9	...	...	...	...	...	10·84	3·35
,, Kuala Selangor	...	...	...	...	...	...	...	...	...	...	...	9·38	2·00
,, Kuala Kubu	...	...	...	90·3	71·3	19·0	...	...	...	...	...	9·74	2·04
,, Serendah	...	...	...	89·6	74·4	15·2	...	...	...	...	...	17·53	3·16
,, Rawang	...	...	...	90·3	69·4	20·9	...	...	...	...	...	14·45	3·40
Beri-beri Hospital, Jeram	...	...	...	...	...	...	...	...	...	...	...	5·95	2·11
Sabah Bernam	...	...	...	...	...	...	...	...	...	...	...	13·06	2.40

E. A. O. TRAVERS,
State Surgeon, Selangor.

State Surgeon's Office,
Kuala Lumpur, *22nd December*, 1905.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for the month of December, 1905.

District.		Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
				Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	... ...	29·884	148·8	81·3	89·9	71·5	18·4	76·5	0·840	74·0	80	Calm.	19·22	2·48
Pudoh Gaol Hospital ,,	... ...	...	...	...	...	...	...	...	...	...	...	...	13·99	1·67
District Hospital ,,	... ...	...	...	...	...	...	...	...	...	...	...	...	12·39	1·87
,, Klang	... ...	...	...	...	88·0	70·6	17·4	...	...	...	...	...	17·01	2·77
,, Kuala Langat	... ...	...	...	...	...	...	...	...	...	...	...	...	8·45	1·73
,, Kajang	... ...	...	...	...	90·6	71·7	18·9	...	...	...	...	...	13·04	3·12
,, Kuala Selangor	... ...	...	...	...	...	...	...	...	...	...	...	...	10·29	2·25
,, Kuala Kubu	... ...	...	...	...	90·6	71·0	19·6	...	...	...	...	...	14·06	3·50
,, Serendah	... ...	...	...	...	89·9	71·9	17·9	...	...	...	...	...	8·21	1·46
,, Rawang	... ...	...	...	...	90·6	69·0	21·6	...	...	...	...	...	8·89	1·45
Beri-beri Hospital, Jeram	... ...	...	...	...	...	...	...	...	...	...	...	...	15·70	3·60
Sabah Bernam ...	... ...	...	...	...	...	...	...	...	...	...	...	..	8·30	1·62

State Surgeon's Office,
Kuala Lumpur, 15th *January*, 1906.

A. J. McCLOSKY,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for the month of October, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis ...	...	...	...	92·0	70·0	17·93	...	...	...	...	...	11·64	1·42
Raub ...	...	...	...	92·0	68·0	17·33	...	...	...	...	...	8·43	1·05
Bentong ...	...	...	...	92·0	69·0	17·61	...	...	...	...	...	15·90	4·17
Temerloh ...	...	...	...	97.0	71·0	15·81	...	...	...	...	...	4·84	1·17
Pekan ...	...	...	...	91·0	71·0	13·35	...	...	...	...	...	7·95	1·75
Kuala Kuantan ...	..	...	...	90·0	72·0	13·03	...	...	...	...	...	5·68	1·58

KUALA LIPIS,
9th December, 1905.

K. TAMBY,
for State Surgeon, Pahang.

Muar.

Abstract of Meteorological Readings for the month of November, 1905.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Lanadron Estate ...	...	...	80°	89°	72°	17°	73°	...	...	...	...	11·84	2·22

MUAR, *3rd December*, 1905.

ROGER PEARS.

The Duff Development Company, Limited, Kelantan.

Abstract of Meteorological Readings for the month of November, 1905.

DISTRICT.	Temperature.			Total Rainfall.	Greatest Rainfall during 24 hours.
	Maximum.	Minimum.	Range.		
	Mean. °F	Mean. °F	Mean. °F	Inches.	Inches.
Kuala Lebir ..	87·4	70·5	16·9	16·60	4·93
Ulu Liang ...	85·3	70·7	14·6	17·42	4·63
Serasa ...	91·0	70·0	20·1	8·12	1·54
Kuala Kelantan ...	82·7	74·0	8·7	21·30	11·44

SURGEON'S OFFICE,
8th December, 1905.

JOHN D. GIMLETTE,
Surgeon.

METEOROLOGICAL OBSERVATIONS.

Table Showing the Daily Results of the Reading of Meteorological Observations taken at the General Hospital, Seremban, for the Month of November, 1905.

Date.	Temperature of radiation.						Temperature of radiation.				Wind.		Temperature of evaporation.			Computed vapour tension.			Relative humidity.			Clouds 0 to 10			Cloud and weather Initials.			Rain.
											Direction.																	
	9 H	15 H	Mean.	Maximum.	Minimum.	Range.	Sun	Difference sun and shade.	Grass.	Difference shade and radiation.	9 H	15 H	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	Mean.	9 H	15 H	21 H	9 H	15 H	21 H	Inches.
	°	°	°	°	°	°	°	°	°	°			°	°	°	in.	in.	in.	°	°	°							
1	78	80	79	80	74	6	144	64	...	...	S.E.	S.E.	74·6	75·	74·8	0·857	0·867	0·862	89	85	87	10	5	5	R	C	C	1·18
2	82	79	80·5	82	72	10	142	60	...	...	S.E.	E.	72·	73·9	72·9	·785	·839	·812	72	85	78·5	0	3	0	B	C	B	·21
3	83	83	83	85	73	12	138	53	...	...	E.	S.E.	74·7	76·3	75·5	·856	·905	·880	76	80	78·	0	5	2	B	C	B	·50
4	78	79	78·5	85	72	13	133	48	...	...	S.E.	S.E.	74·6	75·6	75·1	·857	·888	·872	89	90	89·5	2	2	0	B	B	B	
5	80	83	81·5	84	72	12	133	49	...	...	S.E.	S.E.	75·	76·3	75·6	·867	·905	·886	85	80	82·5	0	5	5	B	C	C	1·05
6	82	78	80	84	72	12	142	58	...	...	S.E.	S.E.	73·6	74·6	74·1	·830	·857	·843	76	89	82·5	0	3	5	B	C	C	·55
7	78	84	81	85	72	13	132	47	...	...	E.	E.	74·6	74·	74·3	·857	·840	·898	89	72	80·5	2	0	2	B	B	B	·05
8	81	87	84	89	71	18	138	49	...	...	E.	E.	74·	77·1	75·5	·849	·933	·891	80	73	76·5	0	0	10	B	B	R	·34
9	80	83	81·5	84	72	12	140	56	...	...	E.	E.	75·	74·7	74·8	·867	·856	·861	85	76	80·5	3	5	5	C	C	C	·33
10	78	83	80·5	84	73	11	138	54	...	...	S.E.	E.	72·9	76·3	74·1	·810	·905	·852	84	80	82·	3	3	5	C	C	C	·20
11	83	80	81·5	85	73	12	151	66	...	...	S.E.	S.E.	74·7	75·	74·8	·856	·867	·861	76	85	80·5	0	2	0	B	B	B	·79
12	81	87	84	88	73	15	151	63	...	...	S.E.	S.E,	74·	77·1	75·5	·849	·939	·891	80	73	76·5	0	0	0	B	B	B	
13	85	87	86	89	73	16	151	62	...	...	N.E.	N.E.	73·4	73·9	78·6	·826	·833	·831	68	65	66·5	0	0	2	B	B	B	
14	81	85	83	86	73	13	149	63	...	...	N.E.	S.E.	76·	76·7	76·3	·897	·927	·909	85	76	80·5	0	0	2	B	B	B	
15	81	81	81	86	71	15	141	55	...	...	S.E.	N.E.	70·9	74·	72·4	·757	·842	·803	72	80	76·	0	2	5	B	B	C	·10
16	79	82	80·5	83	72	11	103	20	...	...	E.	E.	73·9	73·6	73·7	·839	·830	·834	85	76	80·5	3	3	5	C	C	C	
17	80	86	83	88	73	15	127	39	...	...	S.E,	E;	75·	72·8	73·9	·867	·808	·837	85	64	74·5	2	0	5	B	B	C	
18	77	82	79·5	82	72	10	132	50	...	...	N.E.	S.E.	73·6	75·3	74·4	·829	877	·853	89	80	84·5	5	3	3	C	C	C	·14
19	84	75	79·5	84	74	10	145	61	...	...	S.E.	S.E.	74·	73·3	73·6	·840	·820	·830	72	94	83·	0	10	5	B	R	C	·31
20	80	75	77·5	84	72	12	145	61	...	...	S.E.	S.E.	72·8	75·	73·9	·808	868	·838	64	100	82·	0	10	5	B	R	C	·86
21	78	89	83·5	91	71	20	147	56	...	...	E.	S.E.	74·6	74·3	74·4	·857	·847	·852	89	61	75·	3	0	5	C	B	C	·30
22	82	84	83	84	72	12	147	63	...	...	E.	S.E.	75·3	75·7	75·5	·877	·888	·882	80	76	78·	0	3	10	B	C	R	3·36
23	79	84	81·5	86	73	13	151	65	...	...	S.E.	S.W.	75·6	75·7	75·6	·888	·888	·888	90	76	83·	3	3	10	C	C	R	·31
24	81	88	84·5	89	72	17	146	57	...	...	S.E.	N.E.	74·	73·3	73·6	·849	·819	·834	80	61	70·5	3	0	5	C	B	C	
25	78	81	79·5	82	72	10	149	67	...	...	S.E.	E.	74·6	77·	75·8	·857	·847	·902	89	90	89·5	2	5	10	B	C	R	·21
26	79	75	77	82	74	8	142	60	...	...	E,	E,	75·6	73·3	74·4	·888	·820	·854	90	94	92·	3	8	5	C	O	C	
27	78	75	76·5	82	74	8	127	45	...	...	S.E.	E.	72·9	75·	73·9	·810	·868	·839	84	100	92·	3	10	5	C	R	C	·84
28	77	81	79	88	68	20	136	48	...	...	E.	E	71·9	76.	73·9	·783	·897	·840	84	85	84·5	5	2	0	C	B	B	
29	79	82	80·5	83	70	13	140	57	...	...	E.	E.	72·3	70·3	71·3	·793	·742	.767	80	68	74·	0	5	2	B	C	B	
30	77	84	80·5	86	72	14	141	55	...	...	E.	S.E.	70·2	74·	72·1	.739	·840	·789	79	72	75·5	0	0	5	B	B	C	1·94

Total 13·57

STATE SURGEON'S OFFICE,
SEREMBAN, *8th December*, 1905.

R. VAN GEYZEL,
Apothecary.

U. HOLZER,
BINDER,
BOSTON, MASS.